Temporal Variation in the Coral Reefs of the East Coast of the Inner Gulf of Thailand

by

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ABSTRACT

A series of permanent line transects established on fourteen reefs on the eastern seaboard of the Gulf of Thailand were monitored through a three-year period (1995-1998) using a video transect method. Hierarchical cluster analysis shows three distinctive reef community types dominated by 1) *Porites*, 2) *Acropora* and 3) zoantharians. The reefs are developed under naturally turbid conditions and relatively low salinity due to the proximity of four major river outlets located in the uppermost area of the gulf. The number of Acroporid species on the reefs is positively correlated with distance from the major river outlets. Eighty-seven species of scleractinian coral were found on the transects.

Over the three-year period, the comparison of 1995-97-98 matched stations using Repeated Measures ANOVA reveals no significant time-dependent change in percent area cover of reef components except for an overall significant reduction in the faviid coral component. In the 1997-98 matched station comparison, statistical tests reveal significant increases in both *Acropora* and *Porites* components that translated into an overall increase in total living coral cover.

These findings indicate that the overall environmental conditions have been favorable for coral growth. Outcompetition of massive corals by faster growing corals on several reefs also indicates conditions favorable for reef expansion. Growth of newly-formed *Porites* colonies over primary rock substrate and dead coral skeleton was presumably responsible for its rapid increase.

Although these reefs are in an area of rapid industrialization and population growth, resultant anthropogenic effects have not yet stopped active coral accretion.

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INTRODUCTION

Coral reefs are marine, biogenic, wave resistant, carbonate structures also known as bioherms. They are composed of the skeletons of hermatypic or reef-building organisms. These structures develop in situ and not as a result of the solidification of transported remains of dead organisms (Cocks and McKerrow, 1978).

Coral reefs are one of the most biologically complex and diverse marine ecosystems on earth (Achituv and Dubinsky, 1990). They are unique among high-diversity and high productivity marine communities and are distinguished by their ability to thrive in clear oligotrophic waters devoid of high levels of nutrients (Newell, 1972; Richmond, 1993). The relationship between hermatypic corals (reef-building corals) and their symbiotic unicellular algae (zooxanthellae) is central to their ability to thrive under oligotrophic conditions and to the existence of coral reef communities. Photosynthetic zooxanthellae utilize metabolic wastes of their coral hosts and produce photosynthetic, carbon-based nutrient for themselves and their coral hosts.

At present, coral reefs cover some 255,000 km^2 of tropical oceans (Spalding and Grenfell, 1997). The longest of them, the Great Barrier Reef, extends for some 2,000 km along the eastern coast of Australia. Milliman (1973) reviewed the distribution of Atlantic coral reefs which are mostly confined to the Caribbean Basin. Elsewhere, the cold Guinea Current and upwelling along the western shores of Africa as well as heavy sedimentation severely limit the distribution of hermatypic corals along these coasts. On the other side of the Atlantic along the coast of America south of 5° N, reef development is prevented by the high sedimentation rate originating from the Orinoco and Amazon

Rivers. The northern limit of coral reefs in the western Atlantic is in southern Florida. Further north, winter temperatures are too low for the establishment of coral reefs. Stoddart (1969, 1971, and 1973) reviewed the distribution of coral reefs of the Indian Ocean where coral reefs are found in East Africa and in the Red Sea and throughout the Indian and Pacific Oceans. Western Pacific reefs including Hawaii cover approximately 41.2% of global reef area where eastern Pacific reefs may be considered minimum examples of coral reefs (Spalding and Grenfell, 1997). They have developed in possibly one of the most restrictive environments: disturbances are frequent, bioerosion is intense and recovery seems to be extremely slow (Cortés, 1997). From the Somalian and Arabian coasts, coral reefs are excluded due to upwelling. Salinity extremes reaching 46‰ in some parts of the Persian Gulf and 26‰ at Mandapan (Southern India) also limit reef distribution. Reefs are developed on the Indian subcontinent and Malaya only in isolated localities.

Ecological Controls On Coral Reefs

Salinity

Scleractinian corals are relatively stenohaline organisms. Death results when salinity is reduced below 27‰ or increased above 40‰ (Kinsman, 1964; Fagerstrom, 1983). This is the reason why the great majority of coral reefs are found in normal marine water (salinity of 34-36‰) while there is no coral reef formation in freshwater and only low diversity reefs occur in brackish water (Fagerstrom, 1983). Below normal salinity levels carbonate buildup is dominated by vermetids, oysters, serpulids and blue-green algae (Teichert, 1958; Heckel, 1974). Moore (1981) gave a summary of important contributors to the variability of salinity in coastal lagoons where extreme conditions varying from flood inundations to evaporating salt pans may be common annual events. Away from the nearshore influence of river run-off the three most significant determinants of salinity structure are rainfall, evaporation and advection. Veron (1986) stated that only in rare case does the sea water salinity become naturally high enough to have widespread effect on corals. Some experimental studies of the effect of salinity on corals showed that some species (e.g. *Porites spp.*) can grow in salinity exceeding the normal boundaries and ranging from a lower limit of 17.5‰ to an upper limit of 52.5‰ (Goodbody, 1961; Kinsman, 1964; Muthiga and Szmant, 1987). The experimental study by Moberg et al., (1997) revealed that reduced salinity tends to have more effect on the rate of photosynthesis than on respiration in both *Porites lutea* and *Pocillopora damicornis.* The survival of corals in this abnormal salinity depends on the degree of abnormality and the period over which they are subject to the abnormal salinity (Fagerstrom, 1983). According to Muthiga and Szmant (1987), detrimental effects of salinity that disrupt the symbiotic relationship between the coral and zooxanthellae can occur due to physiological stress on the coral animal or on the algal symbionts.

Temperature

Temperature is an important factor in determining the distribution of reef corals which are most abundant at ranges from 25 to 29°C (Kinsman, 1964). This is expressed in latitudinal patterns of coral-reef distribution and diversity. Although reef corals as a group are generally considered stenothermic, the ambient temperature under which a coral species flourishes can differ quite distinctly in different geographic regimes. For example, mean monthly temperatures of unrestricted surface lagoon water at Enewetok Atoll, Marshall Islands exceed monthly mean surface temperatures in Kaneohe Bay, Hawaii by 2 to 5°C. The Enewetok August average maximum temperature (30°C) is higher by 9°C than the Kaneohe Bay February average minimum (21°C). Moreover, in areas of restricted circulation, temperature differences between Enewetok and Hawaii are even more extreme than these values but both still support rich coral growths. Such differences suggest the possibility that the corals resident in the two areas have become physiologically adapted to different temperature regimes (Coles and Jockiel, 1977). Coral can usually withstand limited exposure to low (16-17°C) or high (36°C) temperature. Drastic thermal shifts though, can result in reduced coral vitality (e.g. bleaching and reproductive inhibition) or in extreme instances, destruction of entire reef systems.

Low temperature is a distinct limiting factor in coral distribution (Clausen and Roth, 1975) because at 18°C and below, reef building corals generally are affected adversely and compete unsuccessfully for space with other benthic organisms (Glynn and D'Croz, 1990). High temperature, however, may only occasionally be limiting in the present day ocean where there is rapidly fluctuating temperature.

The first apparent symptom of temperature stress on reef corals is the disturbance of the symbiotic association between animal tissue and endosymbiont zooxanthellae (Coles and Jockiel, 1977). The initial response of stressed corals is partial to total bleaching of the colony (Glynn and Steward, 1973; Coles and Jockiel, 1978). Lesser

(1990) showed that increases in temperature significantly reduce the total number of zooxanthellae per polyp. Numerous cases of coral bleaching and death of corals due to temperature stress triggered by El Niño have been experienced throughout the Indo-Pacific and Caribbean (Lasker et al., 1984; Glynn, 1984; Glynn and D'Croz, 1990).

Light

The dependence of coral reefs on light is mainly associated with the photosynthetic processes of symbiotic algae: zooxanthellae. Light as a limiting physical factor only affects the structure of coral communities in the upper shallow and in the deeper zone of the reef (Sorokin, 1995; Shick, 1995). Goreau (1959), Yoneg (1968) and Yap (1993) among others have reported upon the effect of light on coral growth. Observations by Goreau (1959) clearly show that there is a significant increase in the calcification rate on exposure of coral to light.

One of the most obvious aspects of the distribution of living corals is their decrease with depth. This decrease in the number of coral species, in overall area coverage and in growth rates is observed to be in exponential fashion. This phenomenon, recorded as early as 1825 by Quoy and Gaimard (reviewed by Achituv and Dubinsky, 1990), is today attributed to the parallel, exponential decrease in underwater light. Wells (1957) explained that the depth distribution of coral reefs is a result of the decrease in illumination. He convincingly argued that over the depths in which hermatypic corals occur, temperature and oxygen concentrations are nearly constant, light is reduced in a similar fashion to that of the reef-building organisms themselves.

In general, although the bathymetric distribution of coral reefs is determined by light, their actual depth limit depends on water transparency. Maximal growth usually occurs only down to 30-40% of surface irradiance (the irradiance immediately below the water surface) and rarely is any significant reef formation found below 10% surface irradiance. Single, shade-adapted colonies of shallow water *Stylophora pistillata* grow in the Red Sea even at 0.5 to 1% of surface light intensity (Dubinsky et al., 1984), while species adapted to extremely low light such as *Leptoseris fragilis,* grow at depths where light levels are well below these (Schlichter and Fricke, 1986).

In shallow water, an excess of light can inhibit photosynthesis in endosymbiotic zooxanthellae and reduce the calcification process (Jockiel and York, 1982). Coral might be expected to have developed defenses against photoinhibition. The coenosarc of corals contains pigment and mycosporin-like amino acids (MAAs) that are believed to have protective action against ultra-violet radiation (Sorokin, 1995).

Sediment

Laboratory experiments have documented surprising tolerance by corals to high doses of sediment over short periods of time. Although corals can survive short-term loading at high levels, lower level stress over an extended period of time can gradually wear down the organism's defenses (Taylor and Saloman, 1978). The four most important types of sediment stress are smothering, abrasion, shading and inhibition of recruitment. Of the three, smothering is the easiest to visualize. Under natural conditions, reefs on downwind flanks of large carbonate platforms can be buried by sediment derived from the banktop (Hine and Neumann, 1977). During storms or more recently, during dredging of nearby areas, the level of suspended sediment can increase markedly and result in extensive damage to reef corals and other sediment-sensitive organisms. Such problems have been described in Australia (Fairbridge and Teichert, 1948), Hawaii (Johannes, 1975) and Phuket Island in Thailand (Chansang, Boonyanate and Charuchinda, 1981)

During storms or heavy wave action, physical abrasion by moving sediment can cause substantial damage to coral tissue (Hubbard, 1992). Even under less energetic conditions, sediment scour can play a role in limiting the type of corals that can exist on the shallow reef crest. Although massive corals are more resistant to physical disruption by wave action, their slow growth rates virtually guarantee that wave-induced sediment scour will severely damage or kill a young colony before it can grow above the level of frequent sediment motion. In contrast, rapidly growing branching corals can elevate themselves above this traction carpet quickly (Sakai et al., 1986).

While more subtle in its effects than either abrasion or smothering, shading is probably the most important of all sediment-related effects. The reduced level of light due to suspended sediment in the water column can reduce coral growth, affect natural zonation patterns and induce mortality of entire reef corals if allowed to persist for an extended period of time (Hubbard et al., 1986).

Excess sedimentation can also discourage the settlement of coral larvae. Morelock et al. (1979) discussed the importance of substrate type in larval recruitment in Puerto Rico. Roy and Smith (1971) proposed that in Fanning Island, the increased vulnerability of young corals to sediment damage was more of a limiting factor than sediment covering available space. All these effects can act together to exert a significant natural control on distribution of coral reefs and degree of their development. Hubbard (1986) showed that on local scales, the presence or absence of an updrift source of sediment exerts perhaps the greatest control on location and character of reefs on the north coast of St. Croix. Along a reef system off Costa Rica, Cortés and Risk (1985) proposed that increasing development pressure and specifically widespread agriculture and logging since the late 1950s has gradually reduced coral growth (and probably cover).

Dissolved nutrients

Coral and zooxanthellae need dissolved nutrients for growth, maintenance and reproduction. In particular for zooxanthellae, the most important of these elements are Nitrogen (as NO_2^{-2}, NO_3^{-1}, NH_4^{-1} and dissolved organic nitrogen) and Phosphorus (as PO_4^{-3} and dissolved organic phosphorus and other forms) (Fagerstrom, 1983). These are most often considered to be least available and thus are potential limiting factors in coral reef environments (Smith, 1984).

The source of nutrients to coral reefs depends on reef geography and physiography. Nutrient supply for the open ocean and atoll reefs comes from nutrients advected in sea water and from regenerated, long-term nutrient accumulations in sediment reserves whereas reefs near land receive supplies of nutrients from terrigenous sources via run-off or ground water inputs (D'Elia and Wiebe, 1990). D'Elia (1988) proposes that the major sources of nutrients in coral reef environments are advection, upwelling and endo-upwelling (a localized phenomenon usually associated with updraft and downdraft winds), migration of large organisms, seabird feces, groundwater, precipitation, run-off and resuspension.

Increased eutrophication of a coral reef system has a net effect of increasing algal growth and decreasing coral growth through four main avenues; (1) phytoplankton, (2) periphyton, (3) macro-algae, and (4) zooxanthellae. The increase in nutrients causes an increase in phytoplankton growth. This increases the amount of particles suspended in the water column which decreases the penetration of light through the water. Shading of the corals directly affects the zooxanthellae's ability to effectively photosynthesize and thus lowers the transfer of photosynthate from the zooxanthellae to the coral. Periphyton exhibits a similar effect but instead of blocking the light penetrating the water column, periphyton growing on the surface of the coral directly blocks the light reaching the coral surface. Periphyton growth on the surface of the coral may also be responsible for blocking and decreasing the rate of flow of ambient seawater over the surface of the coral. Macro-algal growth increases competition for substrate (Maragos, 1992; Gabric and Bell 1993). Growing macroalgae will move in near a coral and take over the nearby substrate faster than the slow growing corals. Macroalgae can also shade out nearby corals thus further slowing their growth rate. Finally, zooxanthellae will increase their population density within the coral in eutrophied environments (Stambler et al., 1991). This increase in zooxanthella density is achieved by using photosynthate to increase zooxanthella mitotic events at the expense of the coral which would under normal conditions receive the photosynthate for nutrition (Stambler et al., 1991).

Importance Of Coral Reefs

Modern coral reefs are important for both biological and economic reasons. Coral reefs are found in over a hundred countries, mostly in less economically developed tropical regions. Despite the vulnerability of reefs to overharvesting for export, reef fisheries have served for hundreds and in some locations, thousands of years as a major source of food. People depending on coral reefs for part of their livelihood and for obtaining part of the protein in their diet are estimated to number in the tens of millions (Salvet, 1992).

Approximately 5,500 tons of mother-of-pearl for the curio trade were collected from the coral reef gastropod *Trochus niloticus* in 1978 alone and this figure does not include the weight of meat of this common source of food in the tropical Pacific (Craik, Kenchington and Kellecher, 1990). Other reef invertebrates that provide substantial amounts of food for humans include other gastropods (e.g., the queen conch *Strombus gigas* in the western Atlantic and green snail *Turbo marmorratus* in the west Pacific), bivalves (e.g., several species of giant clams, rock oysters, pearl oysters), octopuses, squids, cuttlefishes, lobsters, prawns and sea cucumbers. Many reef invertebrates are also harvested mainly for subsistence so there are few data available for estimates of the magnitude of the resource.

Corals deposit tremendous quantities of limestone. Large amounts of the coral limestone also contribute to coral rubble and sand. Blocks of living or dead coral are used for building materials, breakwaters and cement. In Sri Lanka in the 1980s, over 2,000 metric tons of living coral skeletons, 7,000 metric tons of coral rubble and 34,000 cubic meters of sand were removed from the coast each year (Wells and Hanna, 1992). However, the economic value in many of resources is far less when extracted than when left in place.

SCUBA diving on coral reefs forms the main base of the economies of a number of tropical developing countries (Sudara, 1981). Tourism of coral reefs brings in about $13 million a year to the national economy of Palau, a Pacific country with a population of 14,000. SCUBA-related tourism brings in about $21 million annually to Bonaire, about half its gross domestic product. In developed countries like the United States and Australia, the economic value of coral reefs for tourism is also large.

The potential for pharmaceuticals from natural products from coral reefs would seem to be greater than from other ecosystems because biodiversity and ecosystem complexity of coral reefs is on a higher scale than in most other systems both from the perspective of evolutionary potential and natural product chemistry. Rainforests are considered to have greater biodiversity at the species level because of insects and flowering plants but coral-reef communities have greater diversity in terms of phyla, diversity of basic body plans and chemistry.

Coral reefs also serve as protection against wave action. During typhoons, hurricanes and monsoonal storms, the damage from wave action to coastal communities is much less where there are reefs. On Guam, the damage from wave action in areas protected by extensive reef flats was minor but in areas around the villages of Inarajan and Merizo where the fringing reefs are narrow, the damages were severe (Birkeland, 1997). In addition, coral reefs protect mangroves and sea grass beds in some localities and thus provide protection for nurseries of commercially important fishes. Coral reefs are self-repairing but the cost of building and maintaining equivalent breakwaters is nearly always omitted in the consideration of the commercial value of coral reefs.

Coral Reefs In Thai Waters

The coastal zone of Thailand is situated in the area from 14°N southward and consists of coastlines along the east and the west coasts of the Gulf of Thailand and the coastline along the Andaman Sea. The total length of the Thai coastline is 2,614 km. Along the coast, coral reefs can be found not only on the rocky shore but around most islands (Royal Thai Navy, 1993)

The east coast of the Gulf of Thailand

The present study was done on reefs of the east coast of the Gulf of Thailand (Figure 3). The east coast of the gulf can be divided into two portions. The upper portion is the coast along the inner part of the gulf which is oriented in a north-south direction. It begins at the mouth of Bangprakong River and extends southward to the city of Sattahip which is also a major naval base. The second portion continues from Sattahip eastward to Rayong then southeasterly to Chantaburi, Trat and the Thai-Cambodia border.

The first portion, the east coast of the inner part of the gulf begins with approximately 20 km of muddy coast from the mouth of the Bangprakong River to Sammok Point. Further on, rocky shore alternates with sandy beaches south to Sattahip. At the middle point of this section lies a single large island named Sichang with a few small islands nearby. Corals are present in parts of these islands. The coral reefs in these islands are not extensively developed. The major factor which affects coral growth in this area is freshwater run-off and flooding from land during the rainy season. In addition, damage to coral reefs by illegal dynamite fishing has been recorded (Sudara, 1981).

Further south from Sichang Island, several islands and islets can be found off Pattaya and the area nearby, i.e., Nok, Sak, Krok, Lan, Pai and Rin Islands. The coral reefs surrounding these islands and islets are extensive and well-developed compared to those in the Sichang Islands. The conservation of these coral reefs was initiated to promote tourism but evidence of illegal dynamite fishing can still be found. In some areas near the islands where deeper coral reefs exist, damage from bottom trawling through these coral beds can be seen.

Toward the extreme outer part of the inner Gulf lie many islands and islets off the Sattahip Region. Most coral reefs around this area are in healthy condition due to protection provided by the navy from the Sattahip naval base. Some reefs around Raet and Samaesan Islands have been affected by military training over the past 20 years and by constant influence of sewage discharge from the city of Sattahip and nearby small villages. Offshore within Rayong, there are several islands, e.g., Saket, Samet, Talu, Man Nai and Man Nok Islands. In certain areas the coral reefs have been destroyed by dynamite fishing. There is now an attempt to incorporate these offshore islands into the National Marine Park.

Eastward from Rayong the coastal area changes to mangrove because of the abundance of rivers and streams. This area at Chantaburi is one of the most extensive

mangrove swamps in Thailand. Coral reefs can be found in some areas both nearshore (Chaolaw Coral Beach) and offshore however, the development of reefs is naturally not extensive because of high freshwater discharge and sedimentation (Poosuwan, 1994).
Trat is the border town. The nearby shoreline is characterized by mangrove and rock. No coral reefs occur due to freshwater run-off and sediment loading. Many islands occur offshore from Trat and the coral reefs around these islands, especially the islands further away from shore are in good condition.

The west coast of the Gulf of Thailand

The inner portion of the west coast consists of mangrove and no coral reefs are found. Further south, sandy beaches occur along the coast. Since no islands lie offshore there is no coral reef development except for some small patches on the small amount of rocky shore. Towards the middle portion of the west coast from Pracheubkirikan southward, there are many offshore islands; Surattani, Samui, Panagn and Angtong. These islands showed extensive coral reef development in the past but now, great portions have been destroyed by dynamite fishing and bottom trawling. Some effort is now being made to protect these islands. In particular, the Angtong Islands have been established as a Marine National Park.

The coast along the Andaman Sea

Along the coast south from the Burma border, mangroves line the shore. Coral reefs can be found only around offshore islands. The coral reefs in Surin Islands, are developed in clear water under quite pristine conditions. Further south, Phuket and other nearby islands such as Phi Phi and Similan have coral reefs that were once beautiful but are now being destroyed by sediment from inland and from offshore tin mining. This is particularly noticeable at Phuket Island.

Previous Work On Coral Reef Communities In The Gulf Of Thailand

Studies of coral reefs in Thailand in general have been going on since about 1976. These studies have emphasized aspects such as taxonomy, ecology, distribution of reef corals and other reef organisms, anthropogenic impacts on reef ecosystems and coral reef management (Chansang and Phongsuwan, 1993). More recently, the distribution and condition of coral reefs in the east coast of the Gulf of Thailand have been studied by many researchers. Srithanya et al. (1981) studied the pattern of distribution of the coral in Lan Island. They found 48 species of scleractinian corals belonging 23 genera and one species of Milleporidae (fire coral). Sirirattanachai et al. (1983 a, b) studied the condition of coral reefs on Raet, Yoh Ieloa and nearby islands in the Sattahip Region. They addressed the deterioration of coral reefs in these areas and claimed that it had been caused by illegal dynamite fishing and sewage discharge from nearby villages. Distribution and community structure of hermatypic corals in the Sichang Islands have been investigated by Sakai et al. (1986). Coral reefs in these islands are dominated by massive forms of *Porites lutea* which show a large proportion of area coverage and high colony counts. Eighty-five species of scleractinian corals were also found as well as one species of fire coral (*Millepora sp.*)

Chou et al. (1990) examined the change over a three-year period (1984-1986) in a coral reef community at Nok Island off Pattaya Bay. They revealed that this coral reef is dominated by *Porites lutea* and little variation in living coral cover was noted over time. On the other hand, the abundance of edible fish species dropped significantly while non-edible species increased implying the selective removal of the former category through fishing. Impacts from both human and natural influences were implicated in these changes.

A quantitative investigation of scleractinian coral communities of Tao Island on the west coast of the Gulf of Thailand was done by Yeemin, Sudara and Chamapan (1994). The study showed that on the exposed reef of the island dominant species were *Pocillopora damicornis* and *Diploastrea heliopora* whereas on the sheltered reef, *Acropora formosa* dominated. They suggested that wind and wave action would probably be the determining factors controlling coral communities on this island.

Other research on the impact of sediment on both growth rate of *Porites lutea* and coral community structure in the Gulf of Thailand was done by Sudara et al. (1991a) and Sudara et al. (1992). At the individual level, they found that the average growth rate of *P. lutea* was significantly negatively correlated with the amount of suspended solid rather than with the sedimentation rate. They felt that this coral species is probably able to shed reasonable amounts of sediment via mucous secretion with some investment of energy whereas suspended solids also reduce light intensity which is essential for coral growth (Sudara et al., 1991a). At the community level, the results showed that high sedimentation can reduce both number of coral species and area coverage by corals and result in a shift of dominant species from fast-growing corals (*Acropora spp.*) to massive corals (*P. lutea*) (Sudara et al., 1992).

According to a study by Sudara, Thamrongnawasawat and Sookchanuluk (1991), the coral reefs developed on the west side of the Gulf of Thailand can be categorized into three distinctive types; 1.) coral community, 2.) coral community developing into a fringing reef and 3.) early formation fringing reef. Reef category is determined by the natural influences of bottom topography, freshwater discharge, sedimentation rate, wind and wave actions and by anthropogenic stress such as increase in sedimentation caused by deforestation and eutrophication due to organic sewage. This reef categorization may be applied to the east side of the gulf because of similar natural influences and anthropogenic stresses.

Sudara, Thamrongnawasawat and Sookchanuluk (1991) referred "coral community" designation to locations in which coral colonies reside on a substratum that clearly does not have the morphology of one of the classical reef designations. Reef formation has not occurred, thus the coral growth is regarded as a coral community. This type of coral community can be further divided into two groups. The first community subtype is a result of wind and the natural effects of wind and wave action such that the corals cannot grow well. This coral community does not have a dominant species and coral density is low. Corals which can grow in such areas are *Porites lutea, Favites spp.* and *Pocillopora spp.* which are tolerant of wind and wave action. This type of reef development can be found in many islands such as Samet and Chumphon on the western side of the gulf and in some areas in the Sichang Islands on the eastern side of the gulf.

The second community type is that developed with high coral density. The dominant species found in this type of coral community development are corals belonging to the genera *Porites* and *Acropora.*

"Coral community developing into a fringing reef" (Sudara, Thamrongnawasawat and Sookchanuluk, 1991) is a coral assemblage that has a reef flat, reef edge and a reef slope but these zones are not clearly defined and the reef usually extends only between 50 and 150 m from shore. On the reef flat, dead corals form a limestone platform. On the reef edge many species of algae are usually found growing on coral rubble. On the reef slope many coral growth forms can be found. Reefs in Chumphon, Samui and the Pha-ngan Islands show this type of reef development. Many of the reefs on the east side of the Gulf of Thailand also fall into this category. Such reefs are on the north-end of Tai Tamun Island, on Krok Island in Pattaya and on Kham and Yoh Island in Sattahip.

Finally, an "early stage formation fringing reef" (Sudara, Thamrongnawasawat and Sookchanuluk, 1991) is far from the shoreline (400-500 m) and dead corals have formed a limestone base. Such a reef can be seen to have well-defined zones. In a shallow lagoon, growth of some algae such as *Halimeda sp.* or some sea grass (*Enhalus sp.*) occurs. None of the reefs on the east coast of the Gulf of Thailand fall into this type.

The Method Used For Coral Reef Monitoring

Most of the invertebrates found in coral reef communities are sedentary or limited in their mobility. In this way, there is some similarity between coral reef invertebrate communities and terrestrial plant communities and it is probably appropriate to adopt techniques used by plant ecologists to study the benthic communities of coral reefs (Loya, 1978). These techniques include line transect methods.

Quantitative studies of coral reef communities using line transect methods

Stoddart (1969 and 1972) reviewed field methods used for quantitative studies of hermatypic corals with special attention to the problems of sampling design, sampling units and data recording. Linear transect use in studies of coral reefs was assorted into two main categories:

a) some form of continuous recording

b) sampling along a transect.

Both methods were designed to study the community structure of hermatypic corals in terms of species composition, zonation and diversity patterns in different reef zones.

Porter (1972) used continuous recording along the transect (category a) to study the species diversity of hermatypic corals on the San Blas coral reefs off the Atlantic coast of Panama. Using a modified line transect method, ten meter long chains with links 1.3 centimeters in length were laid parallel to the depth contour at three meter intervals down the reef face. The number of chain links covering each species of living corals was then recorded. The modified chain-transect was also applied in the study of corals and coral reefs of the Galápagos islands (Glynn and Wellington, 1983). Measurements of coral abundance and epibenthos were taken on totals of thirty-two transects during the 1975-1976 period.

Loya and Slobodkin (1971) and Loya (1972) studied the community structure and species diversity of hermatypic corals of Eilat, Red Sea using for the first time transect sampling (in the sense of category b). Belt transects, which comprised of main transect laid perpendicular to the shoreline and a series of 10-meter transects laid across the main transect, were run underwater to the depth of 30 meters. At each set of belt transect, 10 meter crossing-transects were laid parallel to the shoreline and each other with the fixed one-meter intervals on the reef flat and five-meter intervals on the fore-reef. The individual of sessile organisms was defined as any colony growing independently of its neighbors. The lengths of colonies projected to the line were then recorded for living coverage analysis.

Risk (1972) studied the relationship between reef substrate in terms of both diversity and topographic complexity and reef fish diversity at Greater Lameshur Bay, St. John, Virgin Islands. Quadrat sampling along "T" shaped transects was used. The "upright" transect began about fifty meters offshore at the depth of 4 m and extended 16 m seaward to a depth of 4.5 m. The "crosspiece" transect was also 16 m long and 4.5 m deep throughout its length. On each transect, eight 1×1 m quadrats were sampled to determine reef substrate topographic complexity and its biological diversity and fish species.

The use of line transects in the study of benthic communities in Thai waters was first documented in 1971 in a study of inshore marine habitats of some continental islands in the Western Indian Ocean by Kohn (1971).

Chansang (1984) reported the use of a quantitative survey method in the study of living resources along the coast-line of Phuket island and some islands in the Andaman sea, western coast of Thailand. Their methodology was based on a combination of line transect and quadrat techniques including underwater photography for laboratory analysis. Sudara and Snidvongs (1984) addressed the problem of using the combination of line transects and 1x1 meter quadrats in an early study of coral reefs in the Gulf of Thailand. Because various species of corals are found grouped together within clumps of *Porites lutea*, the dominant species, the quadrat method may or may not cover such clumps and could result in biased figures.

A video transect as a rapid, large area survey method

Phenomena that affect coral reef communities over scales of hectares and larger have proven difficult to study quantitatively. Well-known examples are the outbreaks of *Acanthaster planci*, tropical storm damage, coral bleaching and pollution gradients. Type and quality of information which needs to be gathered over areas of this size differ from that required for detailed study of population and community dynamics at a single location. Many smaller areas need to be surveyed by an efficient field procedure to build up a synoptic view of a much larger area. Manta towing survey is one such technique (Done, Kenchington and Zell, 1981) that is relatively efficient when compared with other field survey procedures. However, the recorded data are counts and judgements based on integration and reduction of a great deal of visual information which makes the data prone to sampling variability between and within observers (Carleton and Done, 1995).

Recently, standard, domestic, video-camcorders in underwater housings appear to offer a means for reducing subjectivity and bias associated with large-scale surveys of coral reefs. Video sampling satisfies several of the fundamental requirements necessary for any monitoring system. It is fast, as there is no requirement to debrief observers in the field. It is simple, as present underwater video systems are light and compact and can be operated and maintained by persons with little training. The permanent visual record provided by videotape also permits multiple re-sampling for information overlooked during initial data extraction and allows the determination of sampling regimes appropriate for the attributes under consideration.

Leonard and Clark (1993) determined the feasibility of using video transects versus using the point quadrat techniques to sample subtidal red algal assemblages. The results revealed that many of the less common red algae could not be resolved using the video transect. More taxa were found by point quadrat technique than by the video transect technique. The video transect technique required less time in the field than the point quadrat technique but laboratory analysis was very time consuming.

Carleton and Done (1995) examined the feasibility of reliably estimating percentage cover of coral reef benthos by the video transect technique. The study concluded that the strengths of this technique lie in cost saving in field expenses on large-scale study and in the production of a permanent visual record. The limitations include a reduction in taxonomic resolution when compared with hands-on field techniques. However, for broad taxonomic categories of coral reef benthos, reliable estimation of relative abundance can be obtained by video technique.

No single set or type of measurements will be ideal or even workable for all locations or at all times and the methodology must be flexible in order to avoid over- or under-sampling. Leonard and Clark (1993) reasoned that because no one data-gathering technique is likely to provide all the information that will be useful, it is best to use a combination of photographic and non-photographic methods. He also mentioned that photographic methods should be a major component of any reef-monitoring program. In particular, photographic or video-transects are essential to any attempt to document changes in reef structure. Unlike any other method, they provide a visual record of reef conditions which can be analyzed when time permits. However, they are time-consuming methods during laboratory analysis and some photographic methods, specifically, computer-assisted image processing of videotapes, have not lived up to expectations.

Objectives Of This Study

Industrial development on the eastern seaboard of the Gulf of Thailand was initiated in the late 1980's. Consequently, population size in the region has grown rapidly as has industrial activity along the coastline. Lack of any well-managed plan for wastewater disposal and pollution control coupled with the increase of population and industry has produced a potential risk for environmental degradation especially in the marine environment. Coral reefs are one of the more important marine resources for local residents because of their use in the fishery, agriculture and tourism industries. Domestic waste and polluted water from industrial processes can have tremendous impact on the coral reef environment through such mechanisms as increased water turbidity, eutrophication, induction of outbreaks of harmful planktonic algae (*Noctiluca scintillans, Trichodesmium erythraeum, Liza spp., Alexandrium sp., Mesodinium rubrum* and *Gymnodium sp.*), growth of epiphytic algae on reefs and increases in the concentrations of heavy metals in sea water. These will both directly and indirectly cause the degradation of the coral reef ecosystem. Despite the anthropogenic cause of coral-reef degradation, natural, stochastic factors are also crucial determinants of coral reef development and decline. For coral reefs in the Gulf of Thailand fluctuations in salinity, temperature and sediment are important factors.

To detect changes in the coral community whether due to natural or man-made effects, permanent transect locations for long-term reef monitoring were established. Analysis of data from these will provide a record of fluctuations in the coral reef system. Because changes in a coral reef may be almost imperceptible over the short term as well as highly variable from one year to the next, looking at the long-term trends in the condition of reefs is important. Given the incredible variety in the structure of coral reefs, it is difficult and risky to depend on a single set of observations or on "indicators" when trying to evaluate reef conditions. For example, high coral species richness is not necessarily a sign of optimal reef conditions because many stresses that affect reefs result in decrease in abundances of organisms rather than loss of species. High density of juvenile corals probably is one of the better indicators of the status of a reef. In general, the best approach is to look for relative changes in a particular reef over time when trying to elucidate trends.

MATERIALS AND METHODS

This study on the temporal variation of the coral reef communities was conducted during a three-year period. In 1995, initial transects were established. They were re-examined in 1997 and 1998.

Most of the coral reefs studied are not extensively developed therefore three, twenty-meter sections of permanent transect adequately represent the entire reef area. Three sections of permanent transect approximately five to ten meters apart were established parallel to the shorelines on coral reefs around selected islands at depths ranging from five to seven meters. On each reef selected, all three transect sections were laid on the same depth contour to minimize the unevenness of area coverage of corals due to bathymetric distribution (Figure 1). Exceptions to using a transect of three sections were made on Sichang Stations 2 and 4 due to relatively small reef areas. Two sections of permanent transect were laid on station 2 and only one was laid on station 4 in the 1997 resurvey. Because these transects were intended to be used for long-term monitoring, stainless steel rods five millimeters in diameter were driven into coral heads to locate the start and end points of each transect section. Every fifth meter along the line was marked by a galvanized steel rod driven into the substratum.

Using SCUBA equipment, benthic organisms and reef substrata directly underneath a measuring tape graduated in millimeter laid along the transect were recorded by video camera housed in waterproof case. The problems of parallax correction in measuring length of organisms underlying the tape were avoided by using a smaller ruler which could be laid directly adjacent the benthos during video recording. Videotapes were taken to the laboratory for further analysis. Selected coral colonies found along the transects were collected for identification to species

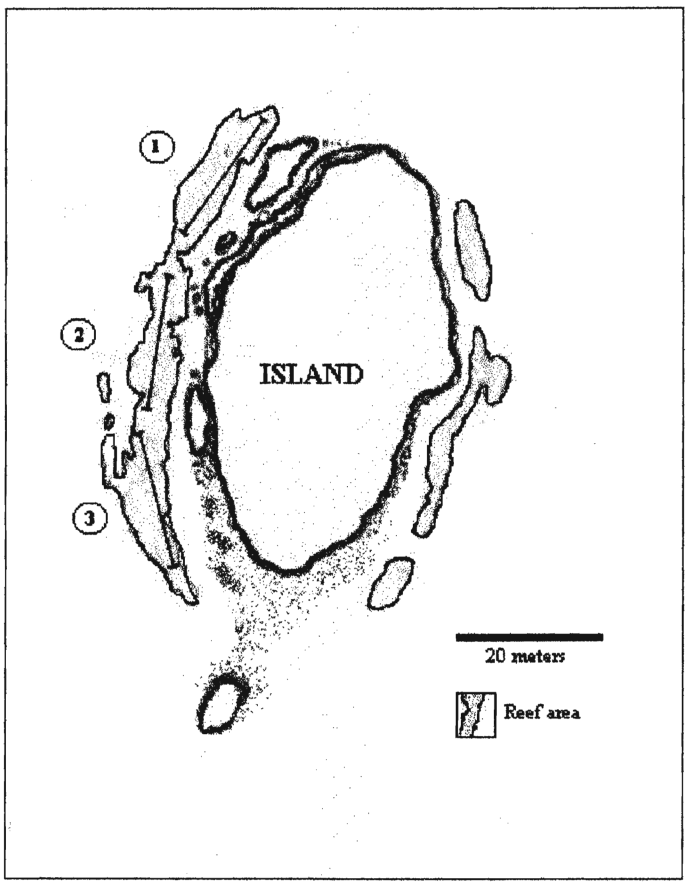

Figure 1. Schematic diagram illustrates the location of three sections of permanent transect. These transects were laid parallel to the shoreline at the same depth with approximately five to ten meters separation.

During the laboratory analysis videotapes were played on a high-resolution 8 mm VCR (SONY model EV-S7000) and displayed on a 21-inch color monitor (SONY Trinitron model KV-20M20). Using freeze-frame mode, length measurements of benthic organisms to the nearest centimeter were read directly off the monitor screen (Figure 2).

For statistical analysis purposes, the three sets of twenty-meter transect were pooled to comprise a single, sixty meter transect to minimize the variation caused by the heterogeneity of the coral community. Percent cover of benthic organisms and reef substrates was then calculated relative to the total length of line transect. The calculation is expressed by:

$$\text{Percent cover} = \frac{\text{Total length of category (or taxon) in centimeters}}{\text{Total length of transects in centimeters}} \times 100$$

During the field study, the physical parameters (e.g. secchi depth reading, temperature and salinity at sea surface) were recorded in situ using a portable water-quality measuring probe (Multi-probe Horiba U-10) and a conventional secchi disc.

For an area near the transect sites, real-time salinity, surface temperature and dissolved oxygen records were obtained from the SEAWATCH satellite buoy database, National Research Council of Thailand. The records of physical parameters around Sichang Islands and Vicinity of Pattaya were received from THAI-1 Buoy located between Sichang Island and Nok Island off Pattaya Bay. The record of physical parameters around Sattahip Region were received from THAI-2 Buoy located east of Sattahip in Rayong Bay (Figure 3).

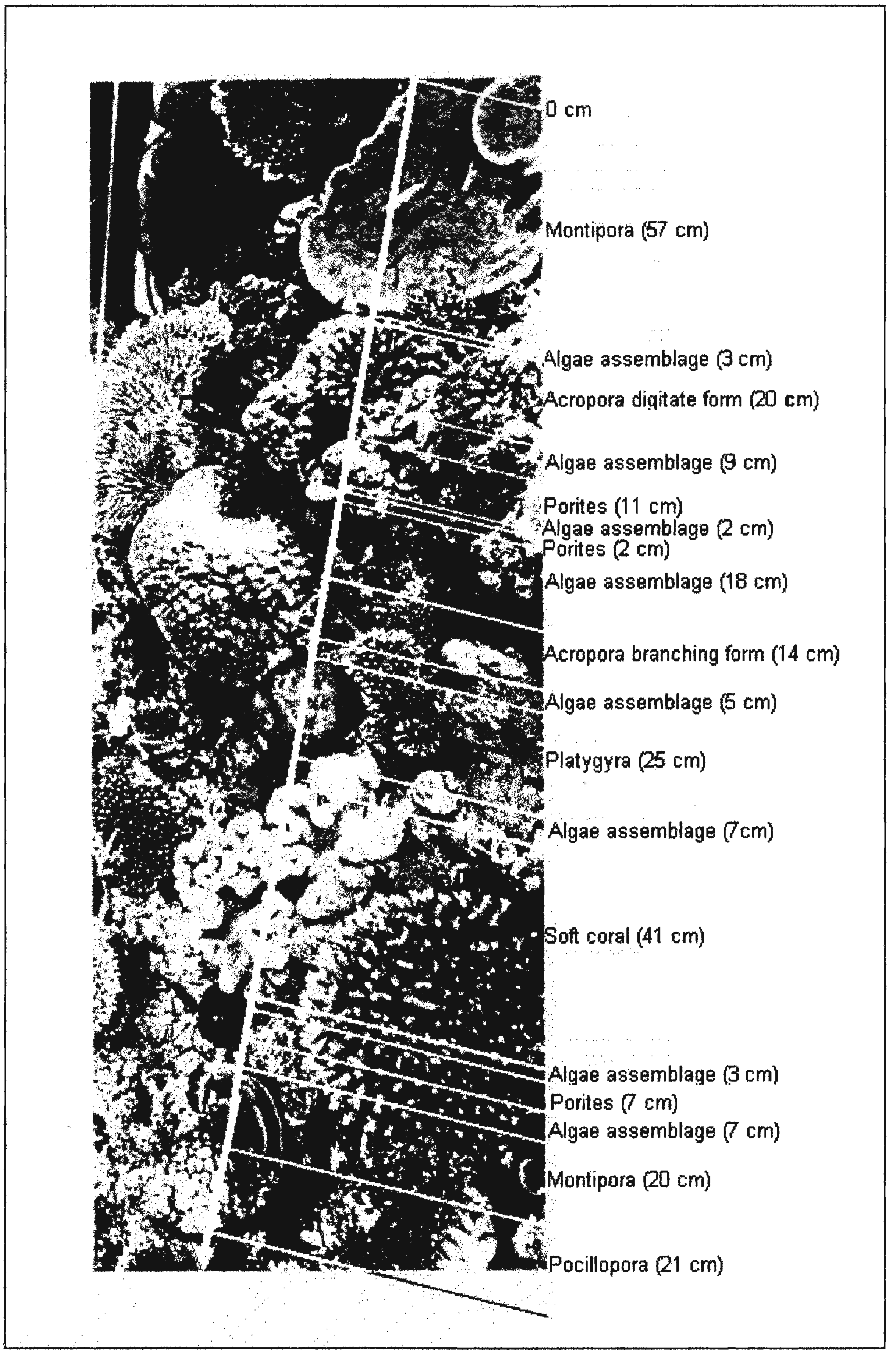

Figure 2. A section of a length of transect shows the corals species and other sessile organisms and their intercepts on a measuring tape which were read off the monitor screen.

Site Descriptions

This study was conducted on the eastern seaboard of the inner Gulf of Thailand in Chonburi Province, Thailand. Study sites representative of three distinctive geographical categories and three different impact types were examined. Coral reefs affected by seasonal freshwater discharge, contamination from spillage of agricultural products during ship loading and by port construction occur around Sichang Island. Reefs showing the impact of tourism occur in the Vicinity of Pattaya. Reefs in Sattahip Region represent relatively undisturbed locations.

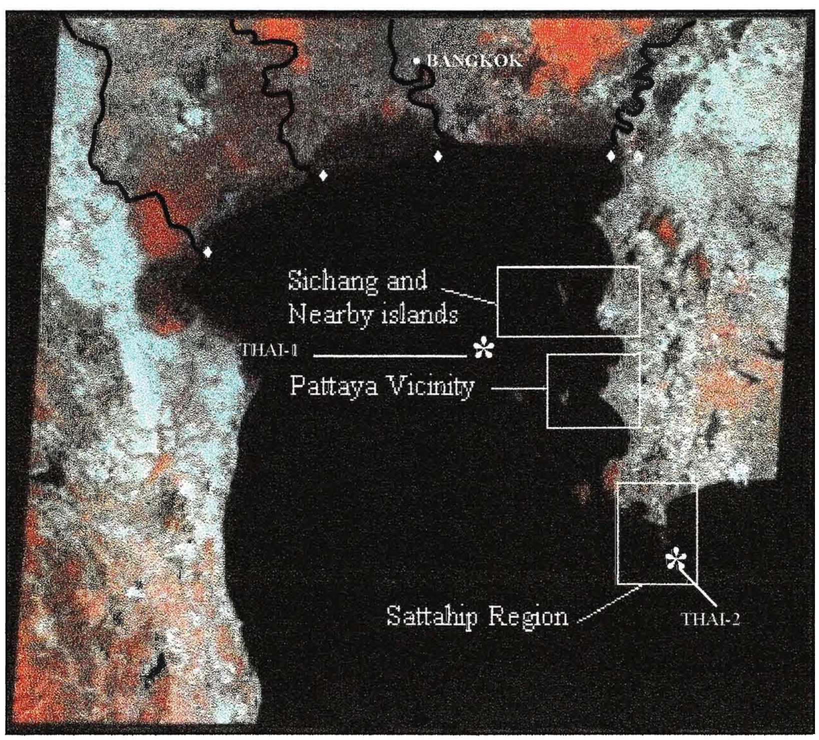

Figure 3. Satellite imagery retrieved from LANSAT illustrates the inner Gulf of Thailand, the geographical locations of study areas, four major rivers (♦) and the locations of satellite buoys THAI-1 and THAI-2 (asterisks). LANSAT Satellite imagery is courtesy of National Research Council of Thailand.

To locate the geographical coordinations of permanent transect locations, a Mercator projection map and Magellan Model GPS (Global Positioning System) were used. In most situations the vessel from which dives on the transects were done was anchored within 10 m of the transects. The position to seconds of longitude and latitude of the vessel and thus the transect site was determined. Non-differential GPS will provide an approximate global position to within a radius of 50 m.

Sichang and Nearby Islands (Stations 1 to 5)

The Sichang group of islands is situated approximately ten kilometers offshore. They consist of one large island (Sichang) and four small islands. Five permanent transect locations were established on coral reefs around these islands.

The transect titled Sichang station 1 is located on the windward side of Tai Tamun Island at latitude 13°06'34" N and longitude 100°43'08" E. Tai Tamun island is immediately south of Sichang main island. It is almost surrounded by fringing reef ranging in depth from 0.5 to 5.0 meters below LLW (Lowest Low Water). The immediate substratum for individual coral colonies is mainly primary igneous rock. A few of the colonies are found growing on a substratum of calcified coral debris.

The transect known as Sichang station 2 is located on a small coral assemblage east of Sichang main island at latitude 13°08'11" N and longitude 100°49'12" E. The coral colonies occur on an elevated primary rock substrate seventy meters in diameter and slightly above the surrounding silt at a depth of 2.5 to 3.0 meters below LLW. This transect location was intended to be a site indicative of the impact of nearby port construction.

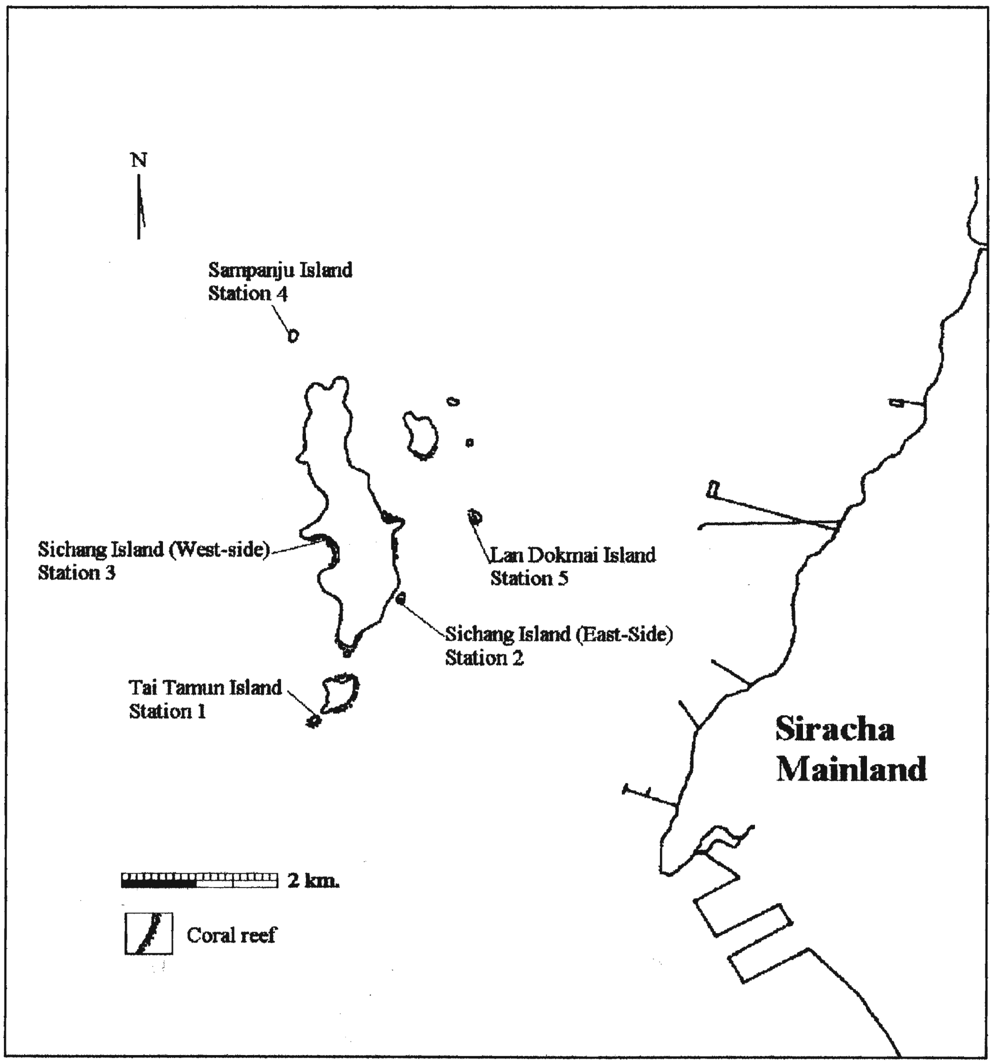

Figure 4. Study stations on Sichang and nearby islands.

Sichang station 3 (West-Sichang Island) is situated on the windward side of Sichang main island at latitude 13°08'51" N and longitude 100°48'10" E facing directly into the south-west monsoon. The transect was located on a coral assemblage attached to the primary rock platform at a depth of 0.5 to 3.0 meters below LLW.

Sampanju Island (Sichang station 4) is an elongated, small, rock foundation approximately fifteen meters across the broadest width and fifty meters in length, north of Sichang Island at latitude 13°11'21" N and longitude 100°47'50" E. The coral benthic community is found on sublittoral rocky outcrops at a depth of 2.0 meters below LLW. The ecological structure of the coral-reef assemblage is not well developed by reason of the effect of freshwater run-off (Mantachitra, 1994). Two, twenty-meter transects were established; one on the leeward and one on the windward side of the island.

Lan Dokmai Island is surrounded by fringing reef and is located at latitude 13°09'06" N and longitude 100°50'01" E. This transect location called Sichang station 5 was laid at a depth of 2.0 meters below LLW on a reef with similar coral reef structure to that of Tai Tamun Island.

Vicinity of Pattaya (Stations 6 to 10)

The reefs selected in the vicinity of Pattaya are located around five islands ranging from 1.5 to 12 kilometers offshore. The Pattaya region is a major tourist attraction with well-developed facilities for water recreational activities including SCUBA diving. Demand for these activities is high. In addition, over-fishing has occurred and contamination from domestic waste has increased since 1986 (UNEP, 1988).

Nok Island, 11.3 kilometers from Pattaya bay is narrow and elongate. This island is almost surrounded by fringing reef formed on igneous rock and rubble substrate. The reefs occur at depths ranging from 2.5 to 5.0 meters below LLW. Transects for Pattaya station 6 were laid on the seaward side of the island at latitude 13°01'23" N and longitude 100°49'20" E. Nok island represents the offshore fringing reef closest to Lam Chabang the area on the mainland that has been designated an industrial zone and which includes a deep-sea port.

The transect named Pattaya station 7 is located on Krok island, two kilometers east of Lan Island at latitude 12°55'50" N and longitude 100°48'23" E. This reef is characterized by coral platform at 2.0 meters below LLW.

The transect called Pattaya station 8 is located on Lan island, the largest island of this group, at latitude 12°54'21" N and longitude 100°46'12" E. It is inhabited by several hundred local villagers and has resorts and hotels on the east side. The well-developed coral reef on the seaward side extends to a depth of at least 10 meters below LLW.

The transect noted as Pattaya Station 9 is located on Jun Island. This island is a narrow, rocky ledge approximately 1.5 kilometers from the beach front of Pattaya Bay at latitude 12°56'47" N and longitude 100°51'35" E. Coral assemblages are found at about 2.5 meters below LLW on both sides of the island. The water surrounding the island is usually murky.

The transect known as Pattaya station 10 is located on Sak island 0.5 kilometers north of Lan Island at latitude 12°56'37" N and longitude 100°47'23" E. Here the typical fringing reef is found around its shoreline at a depth of 2.5 to 5.0 meters below LLW.

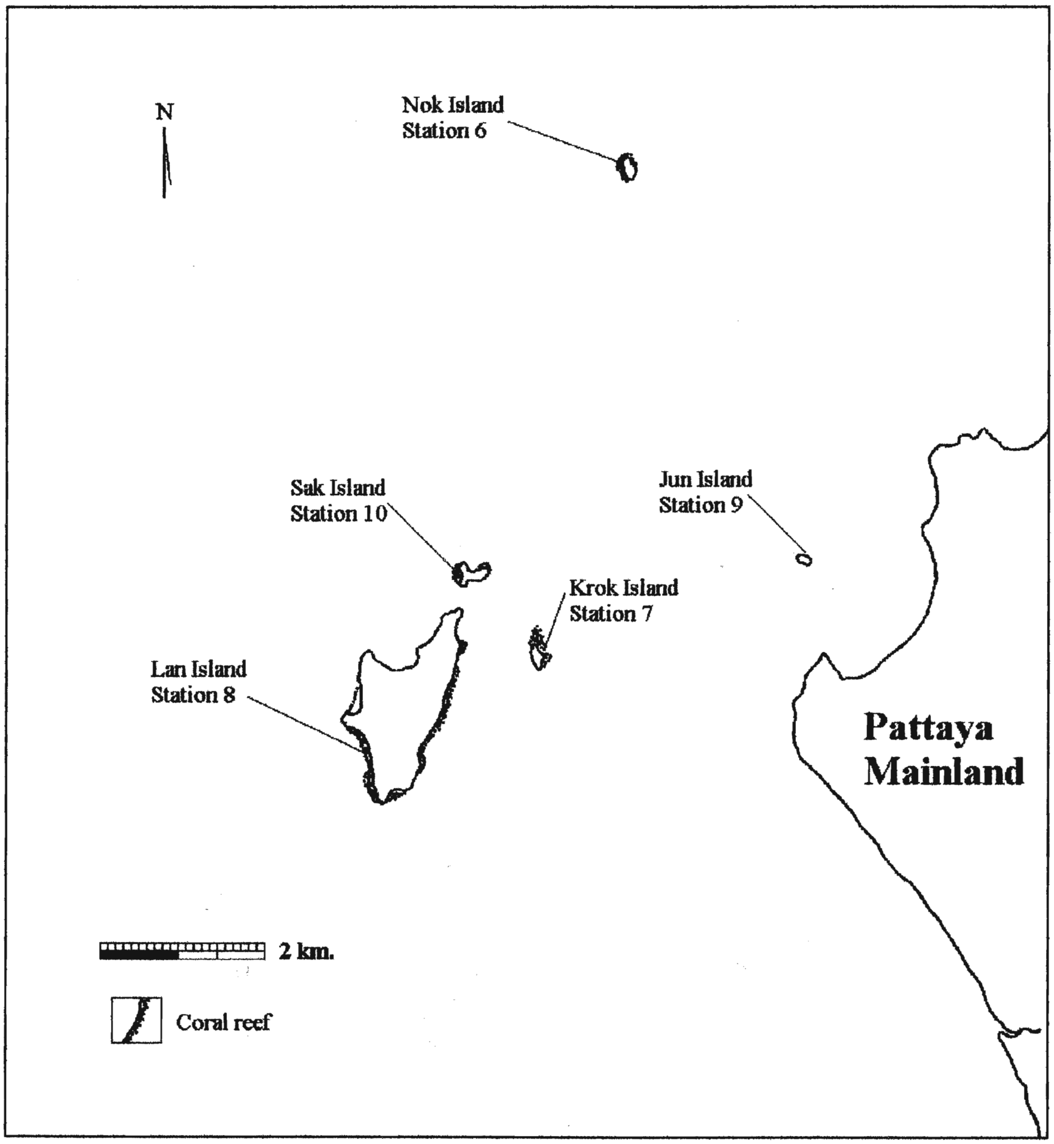

Figure 5. Study stations in the Vicinity of Pattaya.

Sattahip Region (Stations 11 to 14)

Sattahip region has numerous islands along the coastline. Because this area is under the supervision of Royal Thai Navy, any use of and access to these restricted waters must be authorized by the Naval Administration. In 1994, the Marine Park and the Coral Reefs Rehabilitation Pilot Project were established. An agreement between research institutions and the Department of Civil Affairs of Sattahip Naval Base provides researchers with access to the area to assess coral reef status for establishment of a reference data base and a master plan on local marine natural resource management.

The transect known as Sattahip station 11 is located at latitude 12°34'32" N and longitude 100°55'53" E on Kham island. This island is surrounded by well-developed fringing reefs on both northwestern and southeastern sides at a depth ranging from 2.0 to 7.0 meters below LLW. On the northwestern side the coral reef is characterized by the various species of *Acropora spp.* and on the southeastern side, *Montipora sp.* is a dominant species.

Sattahip station 12 is located on Yoh Island at latitude 12°36'59" N and longitude 100°52'42" E. The fringing reefs occur on both northern and western sides of this island. A fringing reef with a higher density of coral occurs on the western side of the island at a depth of 2.0 to 5.0 meters below LLW. On the western side where the line transects were laid, a high energy rocky shoreline is exposed to strong tidal current and occasionally to monsoonal wind-generated waves. The corals found on this station are dominated by tabulate *Acropora* forms.

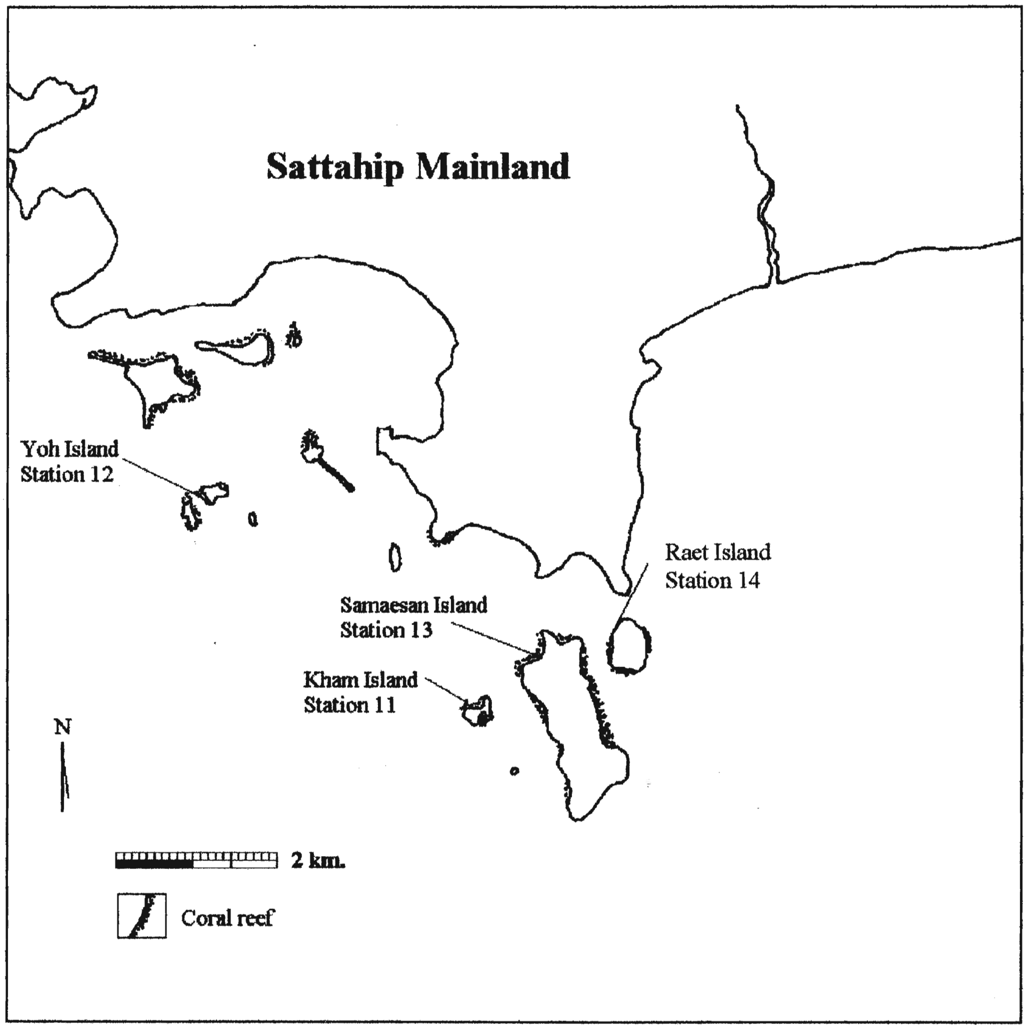

Figure 6. Study stations in the Sattahip region.

The transect known as Sattahip station 13 is located on the north-west side of Samaesan Island at latitude 12°35’03” N and longitude 100°56’38” E. The living corals and other marine benthos are patchy and scattered on coral debris and a sand bottom on this unhealthy fringing reef at 2.0 to 3.0 meters of depth below LLW.

The transect called Sattahip station 14 is located at latitude 12°35’27” N and longitude 100°57’38” E on the northwest side of Raet Island. The coral reef occurs around the island approximately 35 meters away from shoreline, 2.5 meters below LLW. The reef is mainly dominated by *Porites spp.*

Due to the problem of being unable to find the exact locations of some of the former (1995) line transects for which the geographical co-ordinates were received from non-differential GPS (Global Positioning System) new locations for some 1997 transects were established as shown in Table 1.

Table 1. Transect numbers, names and status of match on the three examinations of 1995, 1997 and 1998.

1995 transects	1997 transects	1998 transects
Sichang station 1 Tai Tamun Island	new (same general location)	matched to 1997 transect
Sichang station 2 Sichang Island E-Side	matched (two 20-meter transects)	matched (two 20-meter transects)
Sichang station 3 Sichang Island W-Side	matched	matched
Sichang station 4 Sampanju Island	new (same general location) only one 20-meter transect	matched to 1997 transect only one 20-meter transect
Sichang station 5 Lan Dokmai Island	matched	matched
Pattaya station 6 Nok Island	new (on windward side)	matched to 1997 transect
Pattaya station 7 Krok Island	matched	matched
Pattaya station 8 Lan Island (W-Side)	new (same general location)	matched to 1997 transect
Pattaya station 9 Jun Island	new (on the opposite side)	matched to 1997 transect
Pattaya station 10 Sak Island	not examined	matched to 1995 transect
Sattahip station 11 Kham Island	matched	matched
Sattahip station 12 Yoh Island	matched	matched
Sattahip station 13 Samaesan Island	new location	matched to 1997 transect
Sattahip station 14 Raet Island	new location	matched to 1997 transect

Statistical Analyses

Seven categories were utilized for the delineation of reef components. These were *Porites*, *Acropora*, faviid corals, other living coral, other sessile organism, dead coral and abiotic components. Species level discrimination of scleractinians was not used for categories to avoid the potential problem involving misidentification of corals to species. Coral taxonomy in the Indo-Pacific still remains problematic (Veron, 1995). Percent cover of any category was then calculated by summation of percent cover for member units of that category.

In order to classify the coral community structures, a Hierarchical Cluster (Single Linkage Clustering) Analysis was performed using the Multivariate Statistical Package (MVSP) Version 2.2 (MVSP Inc.). The analysis was based on comparison between transect stations. This procedure involved computation of Euclidean distance of percent cover of common reef components. The classification of a coral reef community is based upon the Euclidean distance matrix and dendrogram derived from the cluster analysis. Note that only the data set obtained from the 1995 sampling was used.

To determine the significance of time-dependent change in percent coverage of the reef components in comparison between 1995, 1997 and 1998 samplings, a statistical analysis of General Linear Model Repeated Measures Analysis of Variance was executed using SPSS Version 7.5.1 (SPSS Inc.). This statistical procedure was described by Bythell, Bythell and Gladfelter (1993). The Repeated Measures ANOVA was performed on each reef component separately. Transects were treated as independent replicates according to their coral reef community structures (reef types) as determined from cluster analysis. Reef types and localities were defined as fixed factors. Prior to statistical testing, units of percent cover were transformed using a square root transformation (Montebon, 1992). The equation for square root-transformation is expressed by:

$$\text{Transformed value} = \sqrt{(\text{Total length of category/Total length of transect})}$$

Statistical tests on three-year comparisons were performed on stations 2, 3, 5, 7, 11 and 12 only because the other 1995 transect locations were not matched.

Two-year comparisons were done on all thirteen stations with 1997-98 matched transects. Station 10 was excluded because transects from 1995 and 1998 only were matched.

Assignment of the Conservation Values

In this study, the R-S-C ternary diagram technique introduced by Edinger and Risk, 1998 was used for reef status assessment. Results of this technique can be used in reef management. The technique involved plotting coral reefs on the R-S-C ternary diagram (r-K-S ternary diagram of Edinger and Risk, 1998) according to the relative abundance (percent area cover) of the coral components and their life strategies. The *Acropora* component is defined as classical *r*-strategist or ruderal (R). The *Porites* and faviid coral components are defined as classical *K*-strategists or stress-tolerators (S). Finally, the other living coral component which includes branching non-*Acropora* corals, foliose corals and other massive and submassive corals is defined as competitive strategist (C). Use of a linear scale (living coral cover) to estimate conservation value may be misleading because it ignores knowledge about the role of disturbance, competition and stress in regulating coral species diversity (Karlson and Hurd, 1993). Note that only the 1995 data set of area cover of coral components was used to construct the ternary diagram.

RESULTS

PART A: DISTRIBUTIONS OF SPECIES SPECIES DIVERSITY AND COMMUNITY TYPES

Distribution of Species

Table 2 lists the Anthozoan species that occur on each study station. The numbering corresponds approximately with the distance of the station from the head of the inner Gulf of Thailand. Some occurrence trends are evident from the table. *Porites spp*. occur on every reef. These are the massive forms of *P. lutea, P. lobata* and *P. australiensis* which are almost impossible to differentiate in the field (Veron, 1986) when they co-occur as is the case in the Gulf of Thailand. *Pocillopora damicornis*, the "hardy, widespread, common and polymorphic species" (Veron, 1986) occurs on almost all reefs. The Family Acroporidae was found to be the most diverse family with thirty-four species recorded. The distribution ranges of most species belonging to the Family Acroporidae are restricted within the Pattaya and Sattahip regions. The most common species of acroporid corals found on most reefs are *Acropora millepora, A. formosa* and *A. hyacinthus.* The other family commonly found in this study is the Family Faviidae whose member species are widely distributed on all reefs but usually with low area cover. The common faviid species are *Platygyra daedalea, P. sinensis, P. lamellina, Favia favus, F. speciosa and Favites abdita.* Other minority species occurring on most reefs are *Pavona spp, Fungia fungites, Galaxea fascicularis* and *Symphyllia sp.*

Table 2. Species list of scleractinian corals and other anthozoans found on 14 study stations off Chonburi Province, the inner Gulf of Thailand (P: species present).

Families	Species	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Station 9	Station 10	Station 11	Station 12	Station 13	Station 14
Pocilloporidae	*Pocillopora damicornis*	P		P	P	P	P	P		P		P	P	P	P
Acroporidae	*Montipora digitata*									P					
	Montipora efflorescens	P			P			P	P	P		P			
	Montipora foliosa							P	P	P		P			
	Montipora incrassata						P		P			P		P	P
	Montipora informis							P							
	Montipora sp.						P				P				
	Montipora spongodes										P				
	Montipora tuberculosa	P							P	P	P		P	P	
	Montipora undata														P
	Acropora anthocercis			P											
	Acropora aspera												P		
	Acropora austera											P	P		
	Acropora cytherea									P					
	Acropora dendrum							P		P			P		
	Acropora elseyi												P		
	Acropora florida								P			P	P		
	Acropora formosa		P				P		P	P	P	P	P		
	Acropora grandis								P	P		P	P		
	Acropora horrida												P		
	Acropora humilis	P		P				P				P		P	
	Acropora hyacinthus				P		P		P	P		P	P		P
	Acropora lovelli								P			P			
	Acropora millepora						P	P	P	P	P	P	P		P
	Acropora nobillis								P			P			
	Acropora samonensis								P				P		
	Acropora selago									P		P			
	Acropora spicifera									P		P	P		
	Acropora spiciosa									P		P	P		
	Acropora stoddarti									P					
	Acropora subulata			P								P			
	Acropora tenuis							P		P		P			P
	Acropora valida							P		P					
	Acropora vaughani											P			
	Astreopora ocellata													P	P
Poritidae	*Porites lichen*													P	P
	Porites spp.	P	P	P	P	P	P	P	P	P	P	P	P	P	P
	Goniopora culumna	P						P			P				
	Goniopora djiboutiensis			P		P								P	P
	Alveopora sp.													P	
Siderastreidae	*Psamocora contigua*	P		P		P	P	P			P	P			
	Coscinaraea monile									P					
Agariciidae	*Pavona decussata*	P		P				P	P						P
	Pavona explanulata	P													
	Pavona lata	P			P			P	P	P	P	P	P	P	P
	Coeloceris mayerii													P	
	Leptoseris sp.					P			P						
Fungiidae	*Fungia echinata*								P			P		P	
	Fungia fungites		P					P	P	P		P	P	P	
	Fungia moluccensis									P					
	fungia scutaria								P			P			
	Lithophyllon sp.	P													
Oculinidae	*Galaxea fascicularis*			P	P			P	P		P	P		P	P
Mussidae	*Lobophyllia sp.*	P						P						P	
	Symphyllia sp.	P		P	P	P	P	P	P	P	P			P	

Table 2 (continued)

Families	Species	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6	Station 7	Station 8	Station 9	Station 10	Station 11	Station 12	Station 13	Station 14
Merulinidae	*Hydnophora microcornos*			P							P				
	Hydnophora exesa								P						
	Scapophyllia cylindrica								P						
	Clavarina srabicula													P	
Faviidae	*Favia amicorum*		P									P			
	Favia favus	P	P	P	P	P	P	P			P	P		P	
	Favia maxima	P	P		P	P					P			P	P
	Favia pallida			P											
	Favia rotumana					P									
	Favia sp.	P		P		P	P		P				P		P
	Favia speciosa			P		P			P	P				P	P
	Favites abdita	P		P	P	P	P	P	P	P		P		P	
	Favites flexuosa									P					
	Favites halicora													P	P
	Favites sp.	P		P	P	P		P							
	Goniastrea aspera			P	P	P	P	P					P	P	
	Goniastrea australensis											P		P	
	Goniastrea edwardsi													P	
	Goniastrea favulus								P	P	P				
	Goniastrea pectinata						P								
	Goniastrea retiformis	P				P		P	P	P	P			P	
	Goniastrea sp.	P		P		P		P		P					
	Platygyra daedalea	P	P	P	P	P		P	P	P	P	P	P	P	P
	Platygyra lamellina	P		P	P	P	P	P	P	P	P	P	P	P	
	Platygyra sinensis	P		P	P	P		P	P	P	P	P	P	P	
	Leptoria phrygia										P				
	Cyphastrea microphthalma											P			
	Cyphastrea serailia									P					
	Echinopora lamellosa								P		P	P	P	P	
Dendrophylliidae	*Turbinaria frondens*			P	P										
	Turbinaria mollis			P		P									
	Turbinaria peltata				P										
Other Anthozoans	*Zooanthus*		P		P	P	P		P	P		P			
	Palythoa sp.	P	P	P	P	P	P								
	Sea anemone (unidentified)		P	P	P					P		P	P		
	Soft corals (unidentified)				P		P	P		P					

Because the Family Acroporidae is one of major reef-builder families (Veron, 1986) and in this study shows the highest species richness. it is worthwhile to examine its regional pattern of distribution. An additional statistical analysis of linear regression was performed between species number and distance from the four main rivers (using SPSS Statistical Software Version 7.5.1). Acroporid corals in stations 13 and 14 were excluded from this analysis because those reefs have been severely damaged by human activities. Statistics revealed a highly significant, positive correlation between species numbers in the Family Acroporidae and the distance from the rivers (Figure 7) with $R^2 = 0.7298$ (df = 1, $F_{regression} = 13.77$, $p = 0.004$). The number of acroporid corals increases appreciably as the distance from the major river mouths increases.

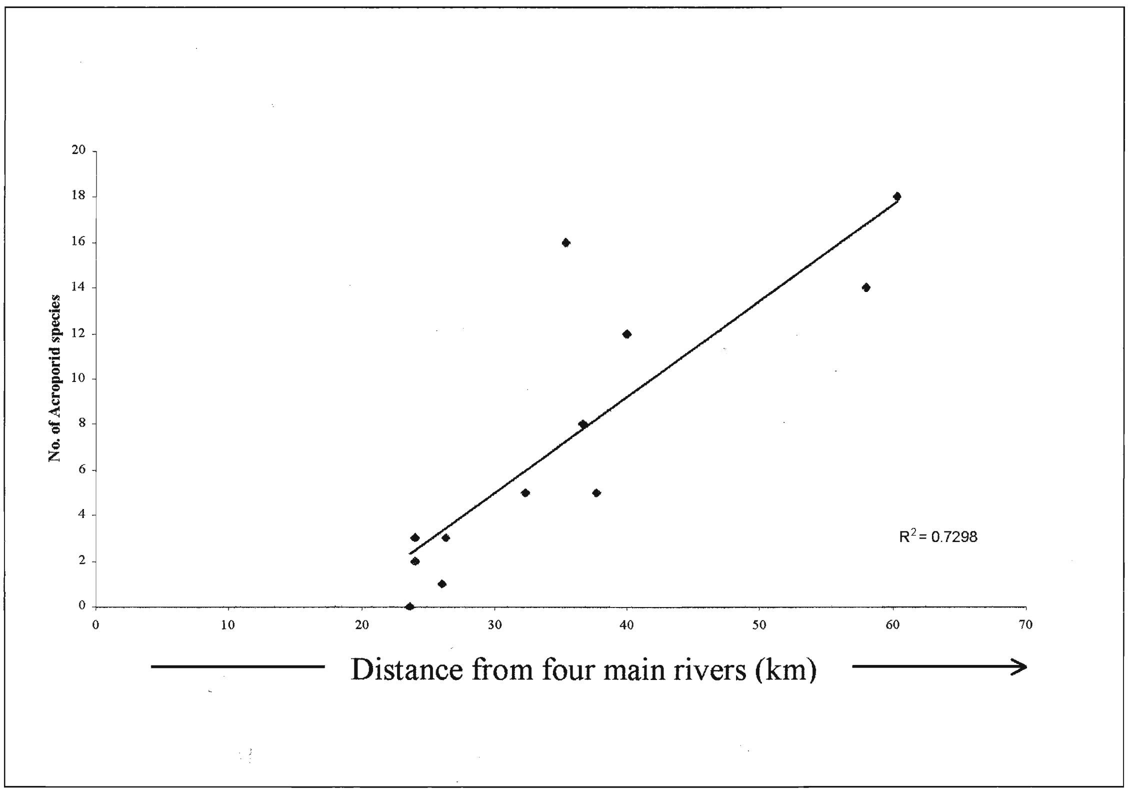

Figure 7. The relationship between species diversity (Number of species) of the Family Acroporidae and the distance from four main rivers at the uppermost area of the Gulf of Thailand plus offshore distance. Stations 13 and 14 in the Sattahip Region where reefs are affected by human-induced impact are omitted. From an additional analysis of linear regression the trend line of increase in number of species of the Family Acroporidae over distance from freshwater discharge is shown with $R^2 = 0.7298$.

Community Types

Figure 8 is a dendrogram representing the classification of the coral communities based on a Euclidean distance (dissimilarity) matrix constructed on the basis of percent coverage of major reef components. This subdivision reflects three quite different types of coral communities, which are referred to as:

Group 1. *Porites* dominated reefs (Station 1, 3, 5, 6, 7, 10, 13 and 14)

Group 2. Zoantharian dominated reefs (Station 2, 4)

Group 3. *Acropora* dominated reefs, and (Station 8, 9, 11 and 12).

Although zoantharians are not corals, these colonial anemones can be a major component of a coral community. Species composition of these coral communities is shown in Table 2 and it indicates that there is considerable overlap in the species composition of communities. Most however are easily differentiated based on their dominant component.

The fourteen reefs of the study stations were categorized as per dominant component. Stations 1 to 7, 10, 13 and 14 are characterized by the dominance of *Porites spp* and clustered with a dissimilarity of 77.22.

Stations 2 and 4 are a subgroup of the *Porites* dominated reefs. A high proportion of cover by *Palythoa* and *Zoanthus* in combination with a low percent coverage of living corals and high proportion of dead coral in stations 2 and 3 except, only low coral coverage with large area coverage of dead corals in station 13 results in the separation of this subgroup from the *Porites* dominated reefs. Dissimilarity of these Zoantharian dominated reefs (stations 2 and 4) is 57.8.

The remaining group whose reefs are characterized by the dominance of *Acropora spp.* are station 8, 9, 11 and 12. These *Acropora* dominated reefs are grouped with dissimilarity of 42.0.

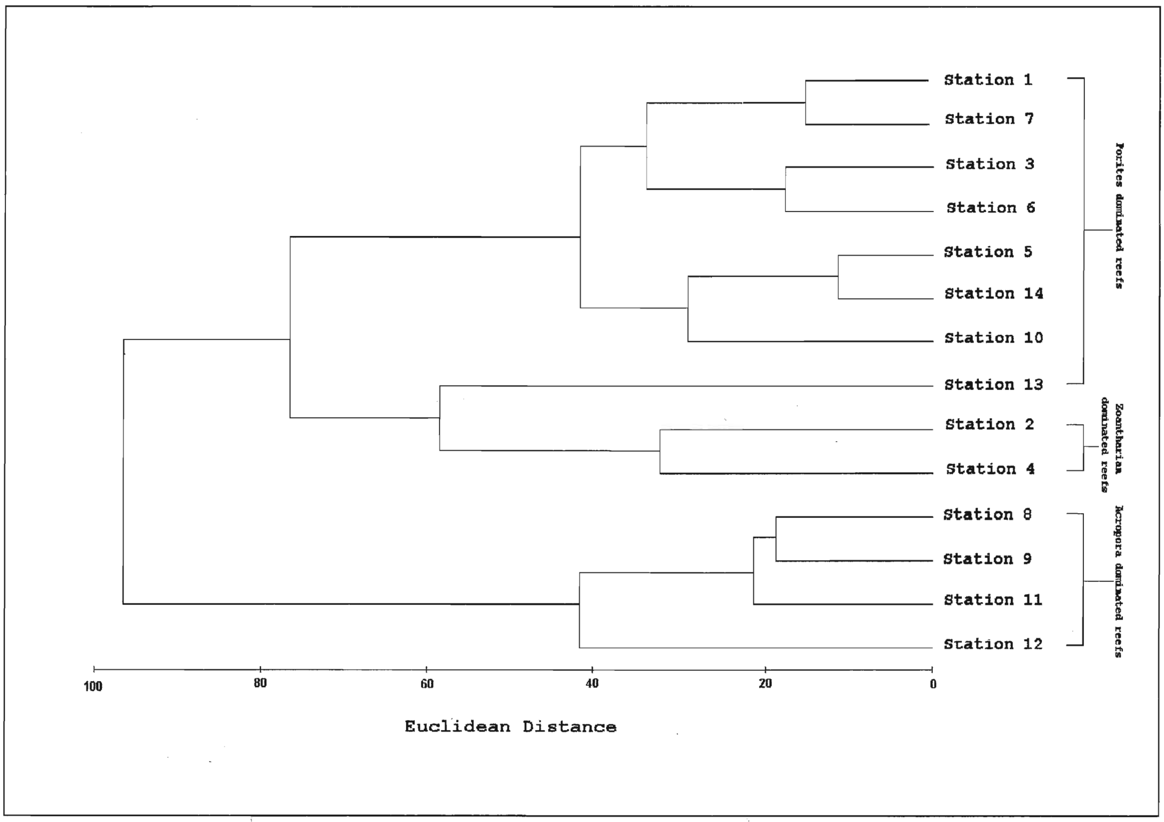

Figure 8. Dendrogram represents a classification of coral reef community structures on 14 study stations located off Chonburi Province. Single linkage hierarchical clustering was used to construct the dendrogram, which is based on between-station comparison of Euclidean distances (dissimilarity) as determined by the SPSS statistical package.

PART B: OVERALL TEMPORAL VARIATION OF REEF COMPONENTS

The statistical analysis of "Repeated Measure ANOVA" was used for determining the significance of change in percent area cover of each reef component. It was performed separately on the six, all-matched stations and the thirteen, 1997-98 matched stations. There are only two stations (Stations 2 and 4) whose reefs are dominated primarily by zoantharians, and Station 2 is only all-matched station. The number of replication within this reef type is statistically insufficient to detect significance of time-dependent change in percent cover. It is reasonable to include these stations with *Porites*-dominated reefs. On the basis of the all-matched station comparison, the numbers of replicates within reef types were 2 and 4 for *Acropora*- and *Porites*-dominated reefs respectively. There are 13 stations which are 1997-98 matched. The numbers of replicates within reef types for the 1997-98 comparison are 3 stations for *Acropora*-dominated reefs and 10 stations for *Porites*-dominated reefs. The survey of all-matched stations extended over three years and only six stations were all-matched. Any statistically-detected significant change in coverage of reef components may not be representative of coral communities in the inner Gulf of Thailand in terms of the spatial scale. A two-year comparison between 1997-98 matched stations with 13 replicates, on the other hand, should better depict the overall pattern of temporal change of reef components. From the statistical results, it is apparent that different types of reef components have undergone different patterns of short-term changes throughout the survey period in respect of relative abundance (percent area cover).

Total living corals (a combination of all coral components)

In all-matched stations percent area cover of total living corals on four reefs out of six increased between 3% and 11% but this did not result in a statistically significant change over the three-year period (Table 3 and Figure 9a). The lack of statistical significance was thought possibly to be due to an anthropogenically-caused decline in area cover of living corals in station 11 as well as a naturally-caused decline in station 7. Omitting stations 7 and 11 from additional statistical testing (Repeated Measure ANOVA), reveals a highly significant change over time in percent cover of total living corals (df = 2, F = 11.500, p = 0.009). Overall mean percent cover for four stations increased from 55.6% in 1995 to 57.0% in 1997 and to 62.3% in 1998.

In 1997-98 matched stations, comparison of time-dependent changes in percent area cover of total living corals was statistically significant. Time-dependent effects on different reef types were also statistically significant (Table 4). Between 1997 and 1998 the overall average percent cover of total living corals increased appreciably from 50.4% to 53.0% (Figure 9b). A major contribution to the increase was from rapid expansion of *Acropora*-dominated reefs whose mean percent cover rapidly increased from 48.8% to 56.6% (Figure 9d). Average percent cover of total living corals in *Porites*-dominated reefs also increased slightly with cover of 50.0% in 1997 and 51.8% in 1998 (Figure 9d). There are also no significant differences in area coverage of total living corals between *Acropora*-dominated reefs and *Porites*-dominated reefs (Tables 3 and 4).

Table 3. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of total living corals in overall comparison and between reef type comparison (*Acropora*- and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations (n_{total} = 6 stations). Because there was only a single replicate in the Pattaya region, the effect of time on change in percent cover within localities could not be assessed.

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	3.737E-03	2	1.869E-03	1.539	0.272
YEARS × REEF TYPES	5.958E-03	2	2.979E-03	2.454	0.148
REEF TYPES	3.928E-02	1	3.928E-02	0.807	0.420
Error (YEARS)	9.712E-03	8	1.214E-03		
Error (REEF TYPES)	0.195	4	4.865E-02		

*$p \leq 0.05$; statistically significant at 0.05 level.

Table 4. Statistical results of Repeated Measures ANOVA for determining significance of time-dependent change in percent area cover of total living corals in overall comparison, between reef type comparison (*Acropora*- and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip regions). Statistical testing was performed on 1997-98 matched stations (n_{total} = 13 stations).

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	6.985E-03	1	6.985E-03	6.799	0.031*
YEARS × REEF TYPES	6.244E-03	1	6.244E-03	6.078	0.039*
YEARS × LOCALITIES	2.806E-03	2	1.403E-03	1.366	0.309
YEARS × REEF TYPES × LOCALITIES	7.076E-04	1	7.076E-04	0.689	0.431
REEF TYPES	9.137E-05	1	9.137E-05	0.003	0.956
LOCALITIES	7.191E-02	2	3.595E-02	1.250	0.337
REEF TYPES x LOCALITIES	0.138	1	0.138	4.801	0.060
Error (YEARS)	8.218E-03	8	1.027E-03		
Error (REEF TYPES with LOCALITIES)	0.230	8	2.876E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

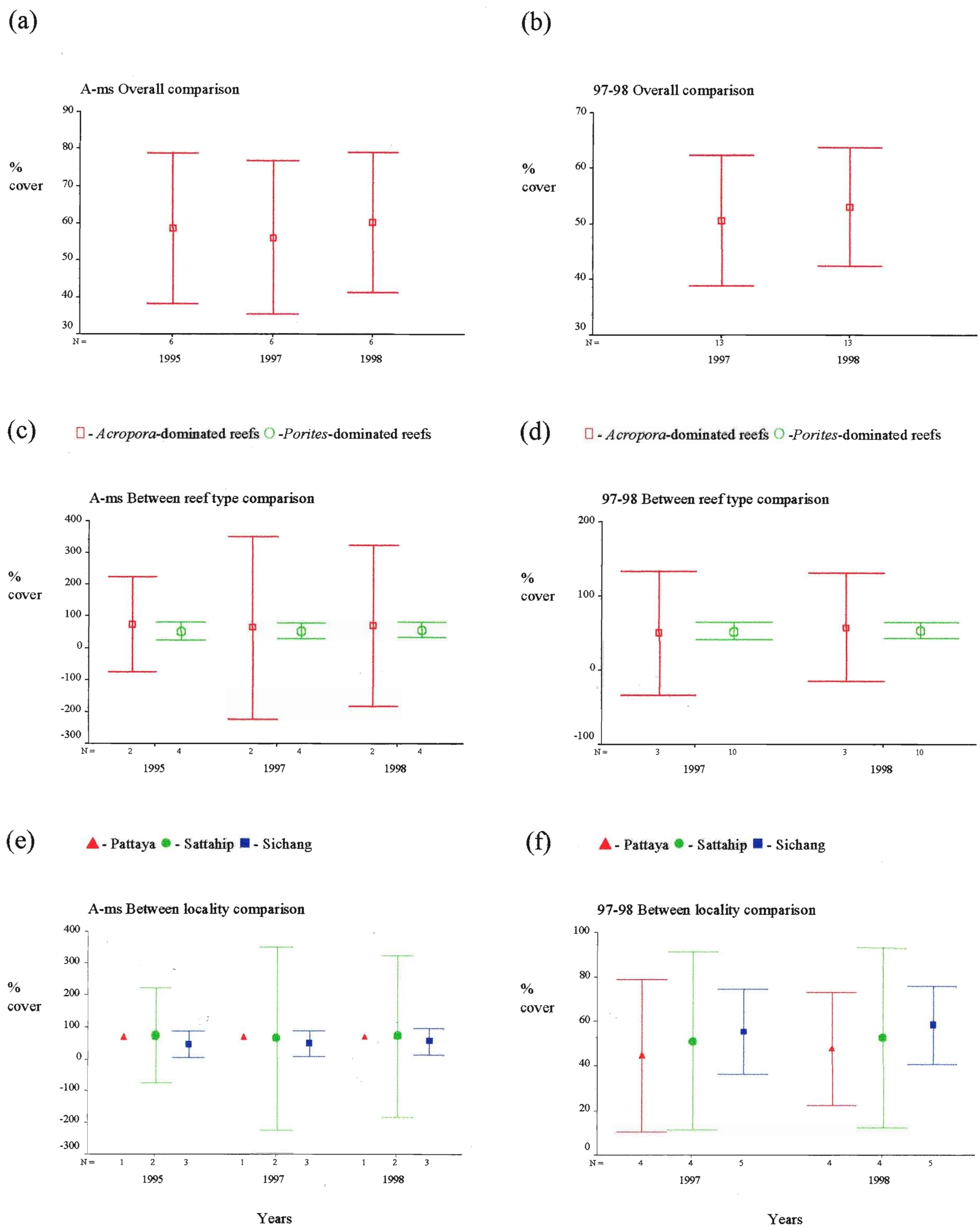

Figure 9. Mean percent area cover (± C.I) of total living corals on all-matched stations (A-ms) and 1997-98 matched stations (97-98) over three years.

***Acropora* component**

An increase in area cover of the *Acropora* component occurred in three all-matched stations, a decrease occurred in stations 3 and 11 and no *Acropora* component occurred on the transect in station 5. The increase in the *Acropora* component ranged from 5% to 9% over three years. A nadir of decline in *Acropora* cover, however, was measured in station 11 in 1997 where the initial *Acropora* cover had been 48.9% and decreased to 21.7% in 1997. At the end of this study, it was re-measured to increase to 25.6% of the transect area. No significant change in percent area cover in the *Acropora* component over time was detected on all-matched stations (Table 5).

Despite that, in a comparison of 1997-98 matched stations, overall the *Acropora* component coverage significantly increased over time and significant time-dependent change in coverage of *Acropora* between localities was also detected (Table 6). Overall mean area coverage of *Acropora* component for 1997-98 matched stations increased from 9.1% to 12.4% between 1997 and 1998 (Figure 10b). As for the effect of time on change in *Acropora* coverage between localities, means for *Acropora* increased from 3.2% to 11.3% in Pattaya and from 24.0% to 27.3% in Sattahip. It declined slightly from 2.0% to 1.4% in the Sichang Islands (Figure 10f).

Table 5. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of *Acropora* component in overall comparison and between reef type comparison (*Acropora*- and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations (n_{total} = 6 stations). Because there was only a single replicate (Station 7 Krok Island) in the Pattaya region, the effect of time on change in percent cover within localities could not be assessed.

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	4.185E-03	2	2.093E-03	0.305	0.745
YEARS x REEF TYPES	1.888E-02	2	9.442E-03	1.375	0.307
REEF TYPES	1.472	1	1.472	28.409	0.006*
Error (YEAR)	5.493E-02	8	6.866E-03		
Error (REEF TYPES)	0.207	4	5.181E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Table 6. Statistical results of Repeated Measures ANOVA for determining significance of time-dependent change in percent area cover of *Acropora* component in overall comparison, between reef type comparison (*Acropora*- and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip regions). Statistical testing was performed on 1997-98 matched stations (n_{total} = 13 stations)

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	2.250E-02	1	2.250E-02	11.704	0.009*
YEARS x REEF TYPES	9.876E-04	1	9.876E-04	0.514	0.494
YEARS x LOCALITIES	4.527E-02	2	2.263E-02	11.773	0.004*
YEARS x REEF TYPES x LOCALITIES	3.449E-04	1	3.449E-04	0.179	0.683
REEF TYPES	0.423	1	0.423	12.115	0.008*
LOCALITIES	6.933E-02	2	3.466E-02	0.993	0.412
REEF TYPES x LOCALITIES	0.181	1	0.181	5.183	0.052
Error (YEARS)	1.538E-02	8	1.923E-03		
Error (REEF TYPES with LOCALITIES)	0.279	8	3.490E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

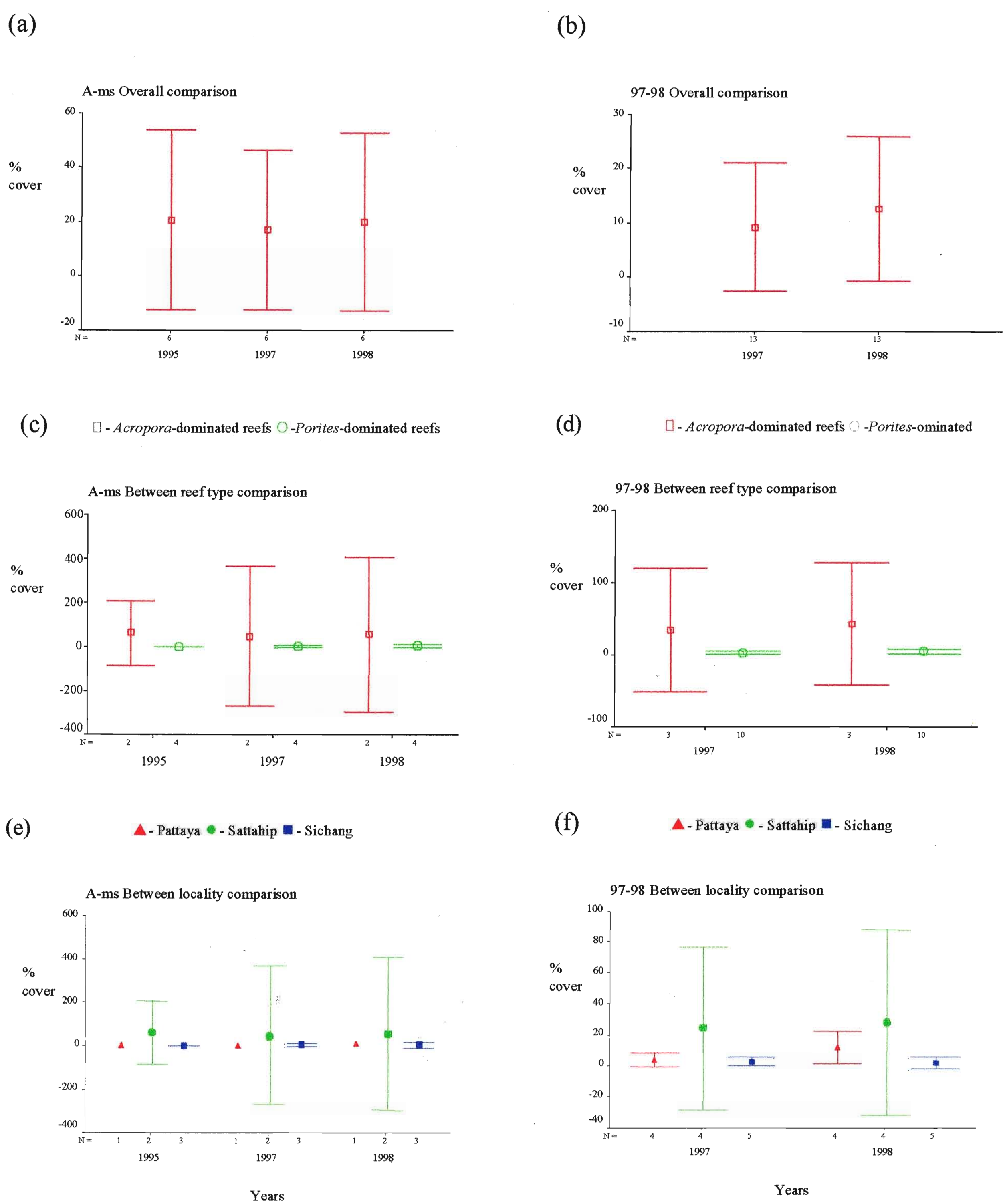

Figure 10. Mean percent cover (± C.I.) of *Acropora* component on all-matched stations (A-ms) and 1997-98 matched stations (97-98) over three years.

***Porites* component**

Over the three-year period, time-dependent change in area cover of the *Porites* component was not statistically significant on all-matched stations (Table 7). Four stations out of six all-matched stations exhibited an increase in area cover of *Porites* component with additional coverage ranging from 1% to 5%. A single station (station 5) exhibited a continuous increase in area cover of the *Porites* component with percent cover being of 47.1%, 51.6% and 62.0% in 1995, 1997 and 1998 respectively.

In the overall comparison between 1997-98 matched stations, a significant, time-dependent change in *Porites* coverage was detected. Overall average percent cover of the *Porites* component increased slightly from 29.0% to 30.0% between 1997 and 1998 (Figure 11b). A significant time-dependent change in area coverage of *Porites* between reef types was also detected (Table 8). The *Porites* component gradually extended its coverage from 37.0% to 38.3% in the reefs dominated by *Porites* (Figure 36d). Conversely, in *Acropora*-dominated reefs area cover of the *Porites* component was considerably reduced from 4.12% to 0.9% between 1997 and 1998 (Figure 11d). The effect of overgrowth by *Acropora* was evident in all *Acropora*-dominated reefs especially station 12 with its high density of tabulate and branching forms of *Acropora*.

Table 7. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of *Porites* component in overall comparison and between reef type comparison (*Acropora*- and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations (n_{total} = 6 stations). Because there was only a single replicate in the Pattaya region, the effect of time on change in percent cover within localities could not be assessed

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	2.366E-03	2	1.183E-03	0.502	0.623
YEARS x REEF TYPES	5.066E-03	2	2.533E-03	1.075	0.386
REEF TYPES	1.027	1	1.027	36.358	0.004*
Error (YEARS)	1.884E-02	8	2.356E-03		
Error (REEF TYPES)	0.113	4	2.825E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Table 8. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of *Porites* component in overall comparison, between reef type comparison (*Acropora* and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip regions). Statistical testing was performed on 1997-98 matched stations (n_{total} = 13 stations).

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	1.451E-02	1	1.451E-02	8.107	0.022*
YEARS x REEF TYPES	1.006E-02	1	1.006E-02	5.619	0.045*
YEARS x LOCALITIES	1.520E-02	2	7.602E-03	4.248	0.055
YEARS REEF TYPES x LOCALITIES	1.855E-03	1	1.855E-03	1.036	0.338
REEF TYPES	0.520	1	0.520	24.028	0.001*
LOCALITIES	8.812E-02	2	4.406E-02	2.034	0.193
REEF TYPES x LOCALITIES	8.207E-03	1	8.207E-03	0.379	0.555
Error (YEARS)	1.432E-02	8	1.790E-03		
Error (REEF TYPES with LOCALITIES)	0.173	8	2.166E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

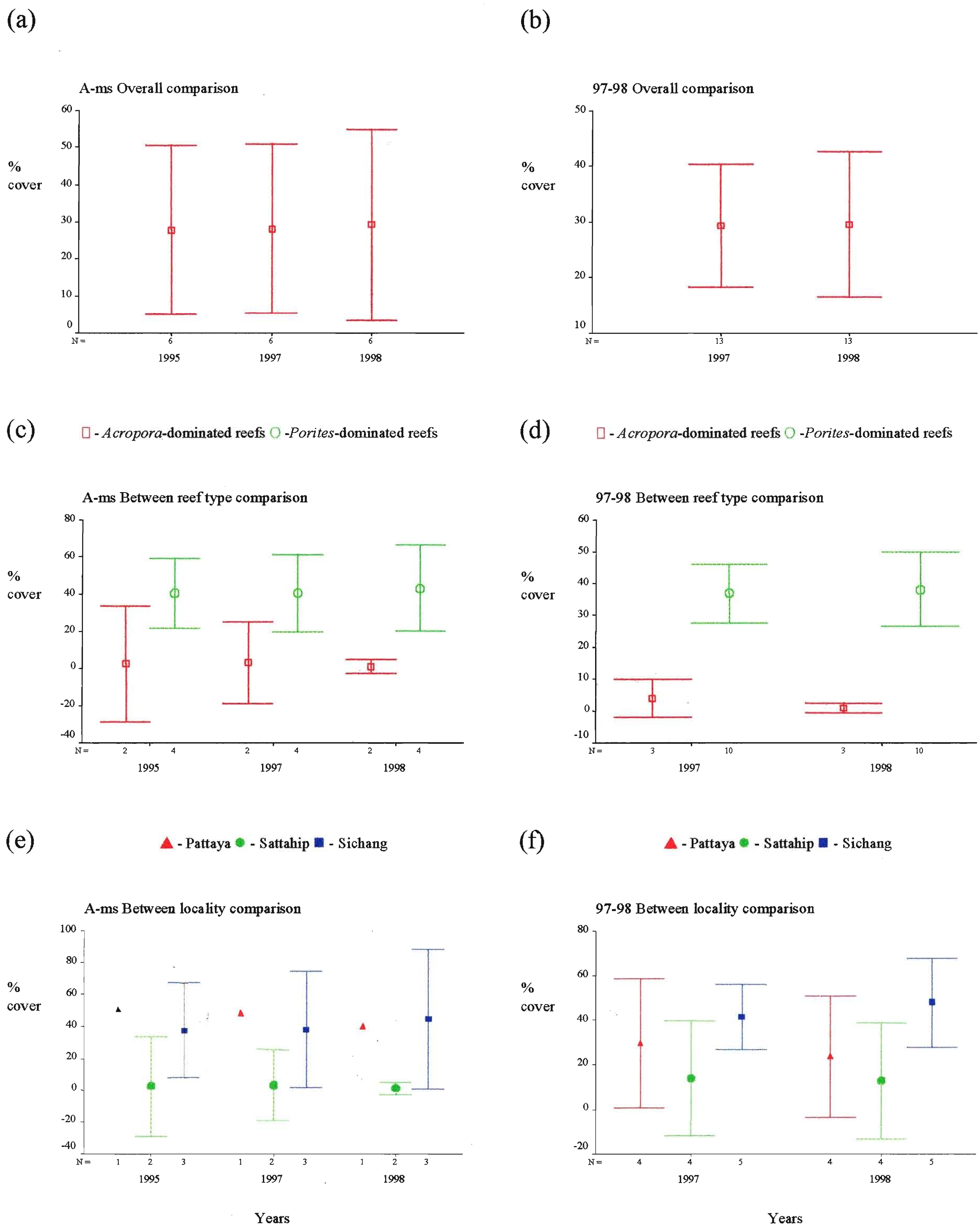

Figure 11. Mean percent cover (± C.I.) of *Porites* component on all-matched stations (A-ms) and 1997-98 matched stations (97-98) over three years.

Faviid coral component

Faviid corals were encountered as a minority coral component on most reefs studied. They occupied between 1% and 14% of reef area. The 1997 transect in Sattahip station 13 is where faviid corals are most abundant. There are no significant differences in percent cover of faviid corals between reef types and localities (Tables 9 and 10).

In a comparison between all-matched stations over three years, statistical results reveals a significant, time-related change in percent cover of the faviid coral component (Table 9). Overall mean percent area cover of faviid corals was measured as 5.7% in the 1995 survey and declined to in 1997 4.8% and 3.6% in 1998 (Figure 12a). Because of high variance within surveys, results for 1997-98 matched stations showed no significant difference between mean percent cover of faviid corals in 1997 and 1998 surveys (Table 10) though mean percent cover of faviid corals on 1997-98 matched stations still shows a reduction over time from 5.1% in 1997 to 3.4% in 1998 (Figure 12b).

Table 9. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Faviid coral component in overall comparison and between reef type comparison (*Acropora* and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations (n_{total} = 6 stations). Because there was only a single replicate in the Pattaya, the effect time on change in percent cover within localities could not be assessed.

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	9.335E-03	2	4.668E-03	5.137	0.037*
YEARS x REEF TYPES	4.105E-03	2	2.052E-03	2.259	0.167
REEF TYPES	7.225E-04	1	7.225E-04	0.055	0.827
Error (YEARS)	7.270E-03	8	9.087E-04		
Error (REEF TYPES)	5.288E-02	4	1.322E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Table 10. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Faviid coral component in overall comparison, between reef type comparison (*Acropora* and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip regions). Statistical testing was performed on 1997-98 matched stations (n_{total} = 13 stations).

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	2.128E-03	1	2.128E-03	1.229	0.300
YEARS x REEF TYPES	6.074E-04	1	6.074E-04	0.351	0.570
YEARS x LOCALITIES	1.080E-03	2	5.400E-04	0.312	0.741
YEARS x REEF TYPES x LOCALITIES	1.605E-03	1	1.605E-03	0.927	0.364
REEF TYPES	3.815E-04	1	3.815E-04	0.031	0.864
LOCALITIES	7.049E-03	2	3.525E-03	0.288	0.757
REEF TYPES x LOCALITIES	7.621E-04	1	7.621E-04	0.062	0.809
Error (YEARS)	1.385E-02	8	1.732E-03		
Error (REEF TYPES with LOCALITIES)	9.793E-02	8	1.224E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Other living coral component

As with the faviid coral component, the other living coral component was encountered on the reefs as a minority component. It included uncommon species of corals with percent covers ranging from 0.4% to 40%.

Possibly because variances among samples are relatively high, no significant time-related changes in percent cover of the other living coral components were detected on either all-matched or 1997-98 matched stations (Tables 11 and 12). Despite lack of significance, a comparison of mean percent cover of other living coral on both all-matched stations and 1997-98 stations reveals a gradual increment. Mean percent cover on all-matched stations was 4.6%, 6.2% and 7.4% in 1995, 1997 and 1998 respectively (Figure 13a). Mean percent cover of this component on the 1997-98 matched stations was 6.9% in 1997 and increased to 7.5% in 1998 (Figure 13b). Additionally, there was no significant difference in the other living coral component coverage between reef types and between localities nor between different reef types within localities (Tables 11 and 12).

Table 11. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Other living coral component in overall comparison and between reef type comparison (*Acropora-* and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations ($n_{total} = 6$ stations). Because there was only a single replicate (Station 7 Krok Island) in the Pattaya, the effect of time on change in percent cover within localities could not be assessed.

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	8.247E-03	2	4.124E-03	1.685	0.245
YEARS x REEF TYPES	6.968E-03	2	3.484E-03	1.424	0.296
REEF TYPES	1.984E-02	1	1.984E-02	0.273	0.629
Error (YEARS)	1.958E-02	8	2.447E-03		
Error (REEF TYPES)	0.290	4	7.255E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Table 12. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Other living coral component in overall comparison, between reef type comparison (*Acropora-* and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip regions). Statistical testing was performed on 1997-98 matched stations ($n_{total} = 13$ stations).

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	2.899E-03	1	2.899E-03	0.427	0.532
YEARS x REEF TYPES	4.685E-04	1	4.685E-04	0.069	0.799
YEARS x LOCALITIES	1.695E-03	2	8.474E-04	0.125	0.884
YEARS x REEF TYPES x LOCALITIES	2.267E-05	1	2.267E-05	0.003	0.955
REEF TYPES	4.155E-03	1	4.155E-03	0.111	0.748
LOCALITIES	2.437E-02	2	1.218E-02	0.324	0.732
REEF TYPES x LOCALITIES	5.714E-03	1	5.714E-03	0.152	0.707
Error (YEARS)	5.429E-02	8	6.787E-03		
Error (REEF TYPES with LOCALITIES)	0.301	8	3.757E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

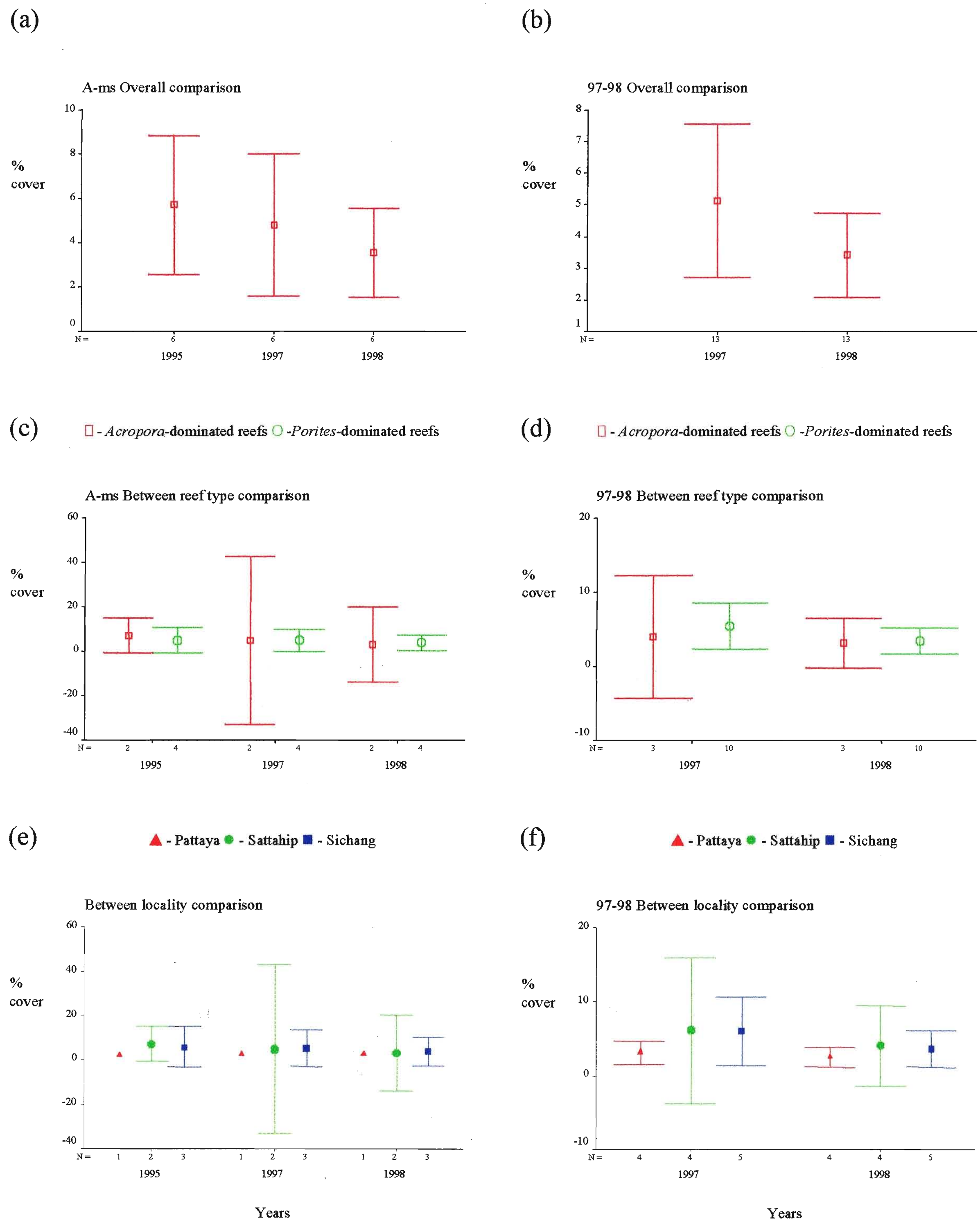

Figure 12. Mean percent cover (± C.I.) of Faviid coral component on all-matched stations (A-ms) and 1997-98 stations (97-98) over three years.

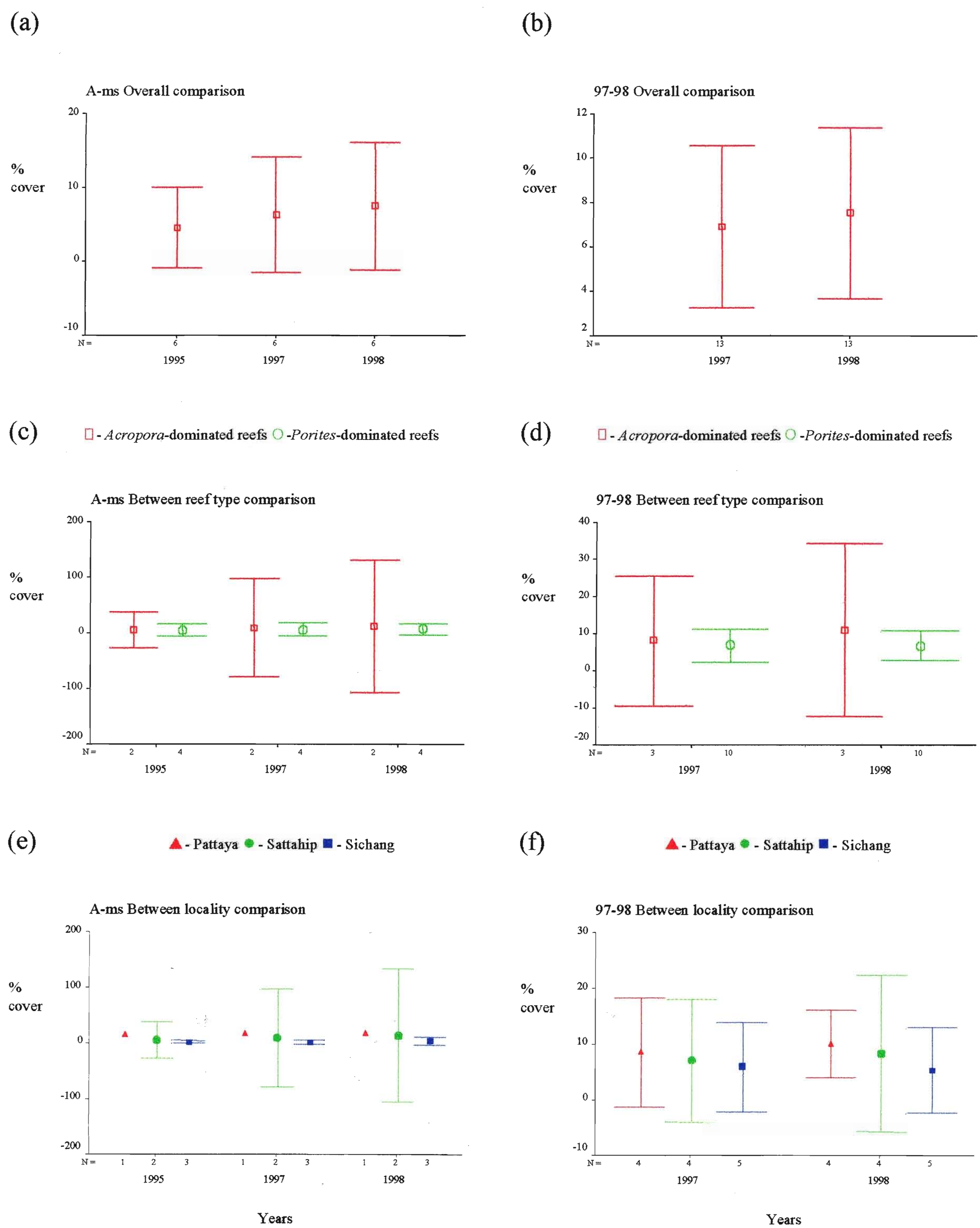

Figure 13. Mean percent cover (± C.I.) of Other living coral component on all-matched (A-ms) and 1997-98 matched stations (97-98) over three years.

Other sessile organism component

No significant, time-dependent changes were detected in overall percent cover of the other sessile organism component on either all-matched or 1997-98 matched stations (Tables 13 and 14). Overall percent cover of the other sessile organism component in respect to all-matched stations was 9.2%, 6.2% and 7.6% in 1995, 1997 and 1998 respectively (Figure 14a). Nonetheless, there was a significant change of percent cover of this component within reef types on the basis of the 1997-98 matched station comparison. Mean coverage of this component on *Acropora*-dominated reefs was 18.8% in 1997and 5.6% in 1998 (Figure 14b). A rapid reduction of zoantharians covering dead corals on the Acroporid reef of Pattaya station 8 contributed in a major way to the decline. Cover on this reef was originally 53.2% but it declined to 5.3%. In contrast, the average percent cover of other sessile organisms on *Porites*-dominated reefs was relatively unchanged 5.6% and 5.4% in 1997 and 1998 (Figure 14b).

Most of the other sessile organisms (e.g. zoantharians, benthic macroalgae, soft corals and encrusting sponges) are either sporadically distributed or widely scattered throughout the reefs. As well, expansion and contraction of area cover are likely seasonal and partially determined by predatory effects.

Table 13. Statistical results of Repeated Measures ANOVA for determining the significance of time dependent change in percent area cover of Other sessile organism component in overall comparison and between reef type comparison (*Acropora* and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations (n_{total} = 6 stations). Because there was only a single replicate in the Pattaya, the effect time on change in percent cover within localities could not be assessed.

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	1.875E-02	2	9.375E-03	2.405	0.152
YEARS x REEF TYPES	4.550E-03	2	2.275E-03	0.584	0.580
REEF TYPES	3.484E-03	1	3.484E-03	0.026	0.880
Error (YEARS)	3.118E-02	8	3.898E-03		
Error (REEF TYPES)	0.537	4	0.134		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Table 14. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Other sessile organism component in overall comparison, between reef type comparison (*Acropora*- and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip. Statistical testing was performed on 1997-98 matched stations (n_{total} = 13 stations).

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	2.952E-02	1	2.952E-02	2.233	0.173
YEARS x REEF TYPES	7.712E-02	1	7.712E-02	5.832	0.042*
YEARS x LOCALITIES	9.506E-02	2	4.753E-02	3.594	0.077
YEARS x REEF TYPES x LOCALITIES	5.630E-02	1	5.630E-02	4.258	0.073
REEF TYPES	0.142	1	0.142	2.983	0.122
LOCALITIES	0.191	2	9.540E-02	2.004	0.197
REEF TYPES x LOCALITIES	3.409E-02	1	3.409E-02	0.716	0.422
Error (YEARS)	0.106	8	1.322E-02		
Error (REEF TYPES with LOCALITIES)	0.381	8	4.761E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

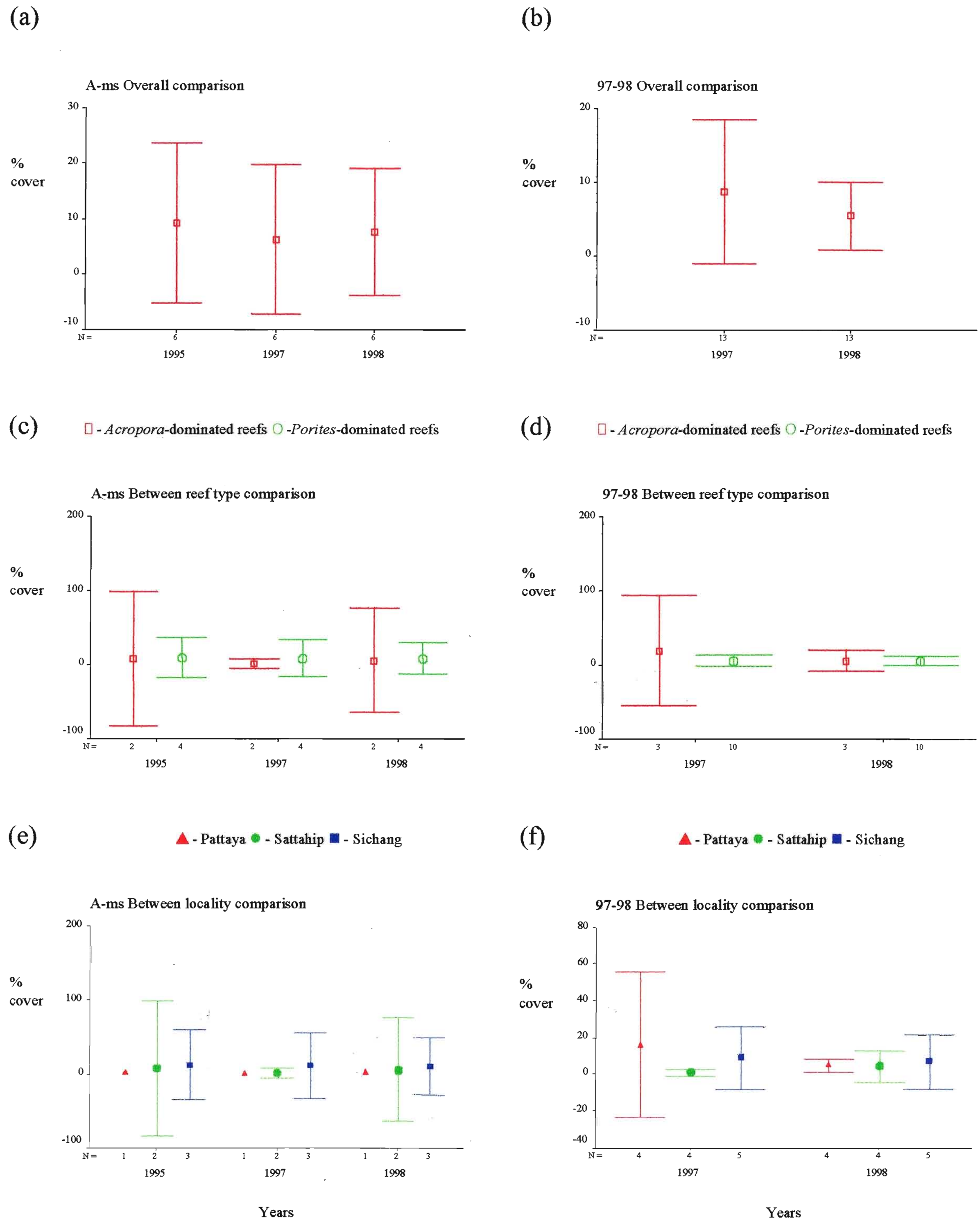

Figure 14. Percent area cover of other sessile organism component on all-matched stations (A-ms) and 1997-98 matched stations (97-98) over three years.

Dead coral component

There was no significant change in overall cover of dead coral over time on the all-matched stations (Table 15). On 1997-98 matched stations there was a time-dependent significant change in overall dead coral coverage as well as a significant, change between localities over time (Table 16). The overall average of percent cover of dead coral on 1997-98 matched stations increased from 18.5% to 22.0% (Figure 15b) as a result of rapid increment of dead coral cover in both the Sichang Islands (from 5.4% to 13.7%) and Pattaya (from13.2% to 26.3%) (Figure 15f). Sattahip on the other hand, exhibited a declining trend from 40.2% to 28.0% (Figure 15f). Of the 1997-98 matched stations three reefs in Sichang Islands (in stations 1, 2 and 4) exhibited a rapid increment of dead coral cover. The increment was not a result of coral die-off but of movement of coral debris by wind-generated waves and water current. Similar effects were also observed in Pattaya stations 6, 8 and 9. In contrast, the increase in area cover of living corals was partially responsible of the reduction in area cover of dead coral in Sattahip stations 11, 12 and 13.

Table 15. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Dead coral component in overall comparison and between reef type comparison (*Acropora-* and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations (n_{total} = 6 stations). Because there was only a single replicate in the Pattaya, the effect of time on change in percent cover within localities could not be assessed.

Source	Type III Sum of Squares	df	Mean Square	F	p
YEARS	2.237E-03	2	1.119E-03	0.157	0.857
YEARS x REEF TYPES	4.205E-02	2	2.102E-02	2.949	0.110
REEF TYPES	3.077E-02	1	3.077E-02	0.390	0.566
Error (YEARS)	5.704E-02	8	7.129E-03		
Error (REEF TYPES)	0.316	4	7.900E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Table 16. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Dead coral component in overall comparison, between reef type comparison (*Acropora* and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip regions). Statistical testing was performed on 1997-98 matched stations (n_{total} = 13 stations).

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	6.676E-02	1	6.676E-02	5.481	0.047*
YEARS x REEF TYPES	3.299E-02	1	3.299E-02	2.709	0.138
YEARS x LOCALITIES	0.138	2	6.876E-02	5.645	0.030*
YEARS x REEF TYPES x LOCALITIES	2.078E-02	1	2.078E-02	1.706	0.228
REEF TYPES	1.366E-03	1	1.366E-03	0.026	0.875
LOCALITIES	0.305	2	0.153	2.958	0.109
REEF TYPES x LOCALITIES	2.832E-02	1	2.832E-02	0.549	0.480
Error (YEARS)	9.745E-02	8	1.218E-02		
Error (REEF TYPES with LOCALITIES)	0.413	8	5.162E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Abiotic component

Statistical results reveals that there was no significant change in overall percent cover in the abiotic component over the three-year period on all-matched stations nor on 1997-98 matched stations (Tables 17 and 18). However, significant change over time between localities was detected in 1997-98 matched stations (Table 18). In Sichang Island and Pattaya, mean percent cover of the abiotic component was 30.0% and 27.0% and decreased to 21.2% and 21.8% respectively (Figure 16f). In Sattahip, mean percent cover of abiotic component increased from 8.1% to 15.6% (Figure 16f). The fluctuation occurring in individual reefs was measured and ranged between 4% and 19%. In most cases change in area cover of the abiotic component was due the movement of sand and silt. Cover of this component can fluctuate widely over short periods depending on direction and intensity of local/seasonal winds, waves and water currents.

Table 17. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Abiotic component in overall comparison and between reef type comparison (*Acropora*- and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations (n_{total} = 6 stations). Because there was only a single replicate in the Pattaya region, the effect of time on change in percent cover within localities could not be assessed.

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	4.458E-03	2	2.229E-03	0.559	0.593
YEARS x REEF TYPES	3.061E-03	2	1.531E-03	0.384	0.693
REEF TYPES	0.419	1	0.419	3.035	0.156
Error (YEARS)	3.189E-02	8	3.986E-03		
Error (REEF TYPES)	0.552	4	0.138		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Table 18. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of Abiotic component in overall comparison, between reef type comparison (*Acropora*- and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip regions). Statistical testing was performed on 1997-98 matched stations (n_{total} = 13 stations).

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	2.441E-04	1	2.441E-04	0.058	0.816
YEARS x REEF TYPES	5.716E-03	1	5.716E-03	1.352	0.279
YEARS x LOCALITIES	4.470E-02	2	2.235E-02	5.284	0.034*
YEARS x REEF TYPES x LOCALITIES	1.899E-03	1	1.899E-03	0.449	0.522
REEF TYPES	0.115	1	0.115	1.822	0.214
LOCALITIES	9.086E-02	2	4.543E-02	0.717	0.517
REEF TYPES x LOCALITIES	0.137	1	0.137	2.157	0.180
Error (YEARS)	3.384E-02	8	4.230E-03		
Error (REEF TYPES with LOCALITIES)	0.507	8	6.338E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

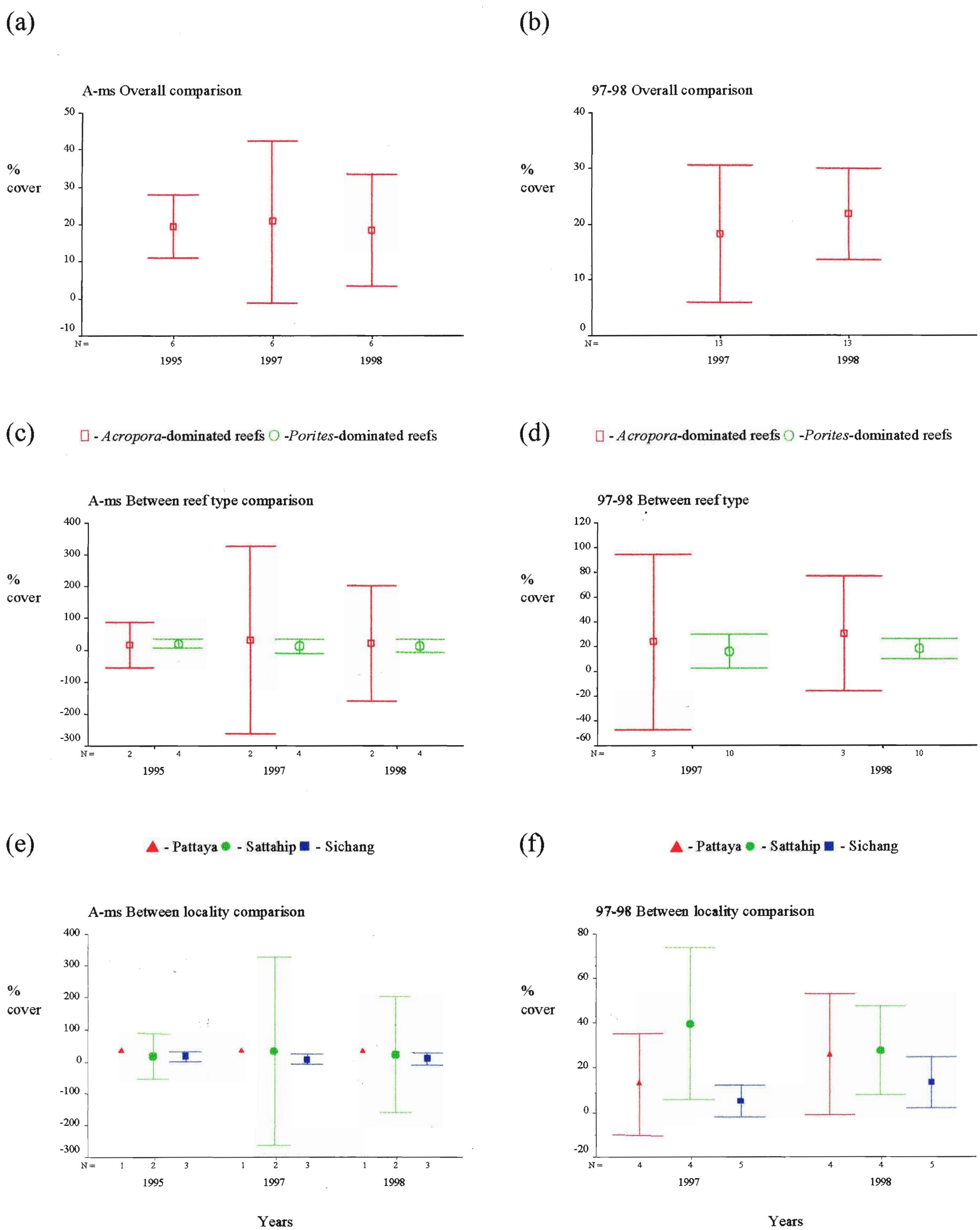

Figure 15. Mean percent area cover (± C.I.) of Dead coral component on all-matched stations (A-ms) and 1997-98 matched stations (97-98) over three years.

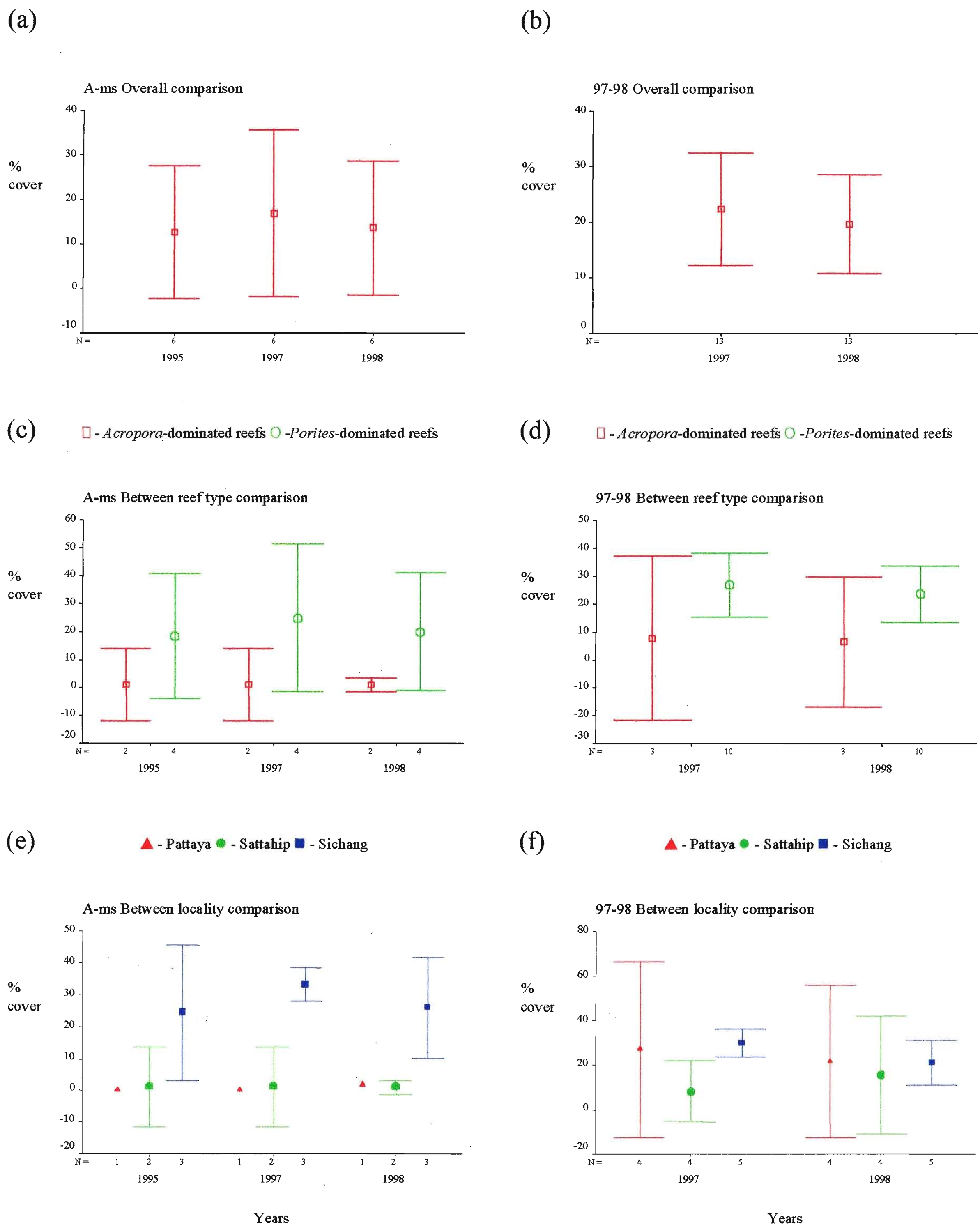

Figure 16. Mean percent area cover (± C.I.) of Abiotic component on all-matched stations (A-ms) and 1997-98 matched stations (97-98) over three years.

Dead coral/abiotic combination

There were no significant changes over time in overall percent cover in the dead coral/abiotic combination on both all-matched and 1997-98 matched stations (Tables 19 and 20). Nonetheless, change over time was detected when comparisons between reef types and comparisons between reef type within localities were done on 1997-98 matched stations (Table 20). In respect to localities, mean percent cover of dead coral/abiotic combination increased from 40.1% to 48.2% in Pattaya; decreased from 48.3% to 43.4% in Sattahip but seemingly remained unchanged with coverage of 35.6% and 34.9% Sichang (Figure 17f). When mean percent cover of dead coral/abiotic combination between reef types between localities were compared, only *Acropora*-dominated reefs in Pattaya and Sattahip exhibited change in the cover of dead coral/abiotic combination. Acroporid reef in Pattaya exhibited an increasing trend in mean percent cover of the dead coral/abiotic combination from 26.6% to 62.5% while Sattahip, in contrast, showed a reduction from 35.2% to 25.4% during 1997-1998.

Table 19. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of dead coral/abiotic combination in overall comparison and between reef type comparison (*Acropora* and *Porites*-dominated reefs). Statistical testing was performed on all-matched stations (n_{total} = 6 stations). Because there was only a single replicate in the Pattaya region, the effect time on change in percent cover within localities could not be assessed.

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	1.421E-02	2	7.103E-03	2.250	0.168
YEARS x REEF TYPES	1.435E-02	2	7.174E-03	2.272	0.165
REEF TYPES	6.726E-02	1	6.726E-02	2.206	0.212
Error (YEARS)	2.526E-02	8	3.157E-03		
Error (REEF TYPES)	0.122	4	3.049E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

Table 20. Statistical results of Repeated Measures ANOVA for determining the significance of time-dependent change in percent area cover of dead coral/abiotic combination in overall comparison, between reef type comparison (*Acropora*- and *Porites*-dominated reefs) and between locality comparison (Sichang, Pattaya and Sattahip). Statistical testing was performed on 1997-98 matched stations (n_{total} = 13 stations).

Source	Type III Sum of Squares	df	Mean Square	F	*p*
YEARS	8.690E-03	1	8.690E-03	5.209	0.052
YEARS x REEF TYPES	8.638E-03	1	8.638E-03	5.178	0.052
YEARS x LOCALITIES	2.513E-02	2	1.257E-02	7.532	0.014*
YEARS x REEF TYPES x LOCALITIES	2.873E-02	1	2.873E-02	17.221	0.003*
REEF TYPES	6.155E-02	1	6.155E-02	2.560	0.148
LOCALITIES	8.294E-02	2	4.147E-02	1.725	0.238
REEF TYPES x LOCALITIES	5.643E-02	1	5.643E-02	2.347	0.164
Error (YEARS)	1.335E-02	8	1.668E-03		
Error (REEF TYPES with LOCALITIES)	0.192	8	2.404E-02		

$p^* \leq 0.05$; statistically significant at 0.05 level.

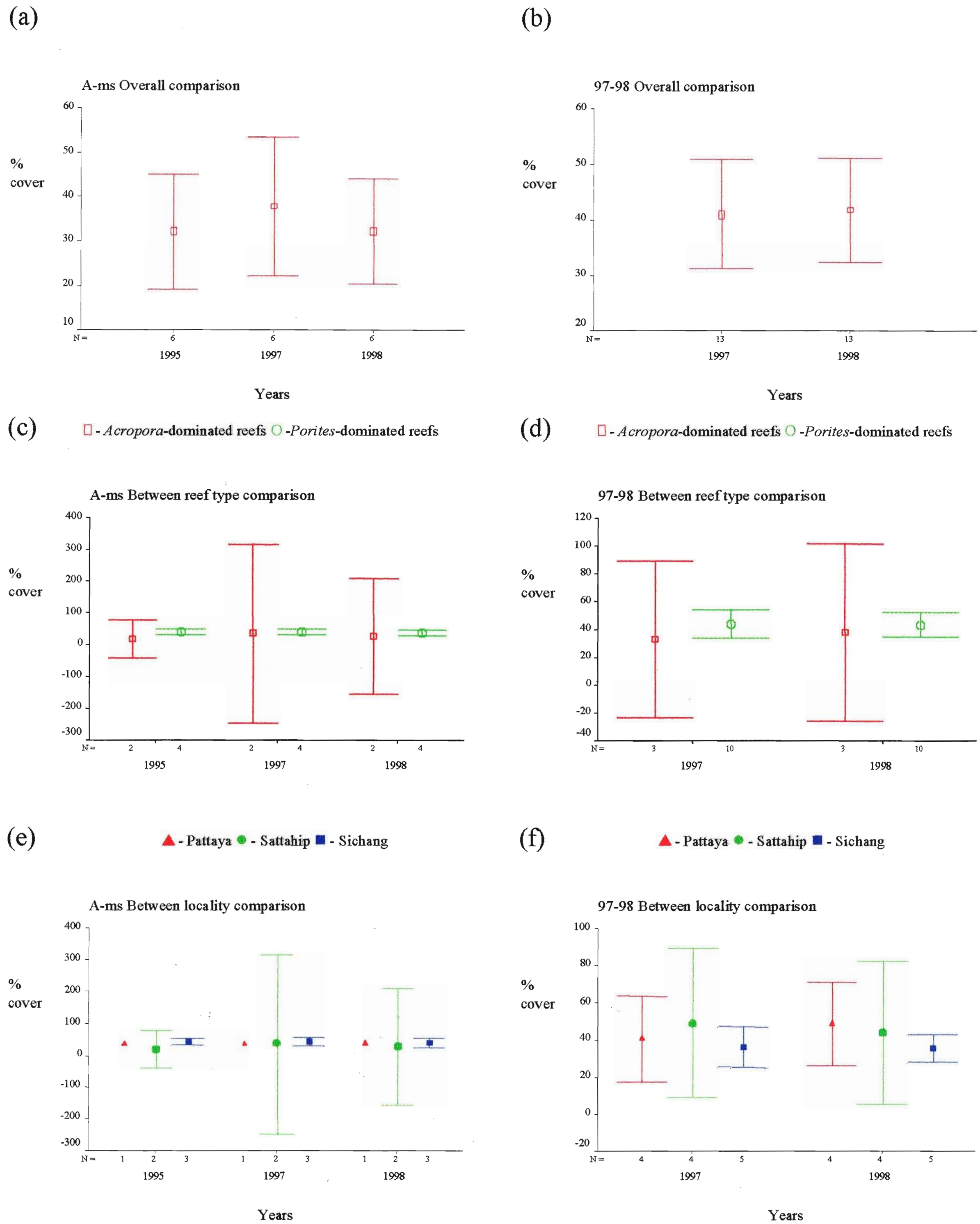

Figure 17. Percent area cover of dead coral/abiotic combination on all-matched stations (A-ms) and 1997-98 matched stations (97-98) over three years.

PART C: WITHIN REEF VARIATION

Sichang Station 1 (Tai Tamun Island)

Sichang station 1 transect is located on the seaward side of Tai Tamun Island where the coral reef is exposed directly to the southwest monsoon during the May to September wet season (Stansfield and Garrett, 1997). The coral reef occurs at a depth of 0.5 to 5.0 m below LLW. Colonies of scleractinian corals grow mainly on primary igneous rock which supports reef formation in this area. Sakai et al., (1986) reported that on the sand bottom, a gradient in grain size was found; sediment was sand-size and became larger further off-reef and deeper. Secchi disc reading, sea surface temperature and salinity during the field study were 5.4 m, 28°C and 34 ‰ respectively.

Twenty-three species of scleractinian corals belonging to eight families were encountered on the line transects during the investigation (Table 2). This coral community is characterized by the massive colonies of *Porites spp.* with *Porites lutea, P. australiensis* and *P. lobata* comprising 40-50% of the surface cover (Figure 18). The second dominant group is Faviid corals which includes *Platygyra daedalea* (figure 19), *P. sinensis, Favites spp.* occupying 5% (Figure 20). Less dominant species were found in the crevices between *Porites* colonies and included *Montipora tuberculosa, M. efflorescens, Pavona decussata* and *Pocillopora damicornis*. The predominant growth forms of coral colonies are massive and submassive (thick-branched). These forms tolerate exposure to high-energy wave and water currents. Although the transect was relocated in 1997 it still represented a similar coral community structure to the original transect with its high coverage of massive forms of *Porites spp.*

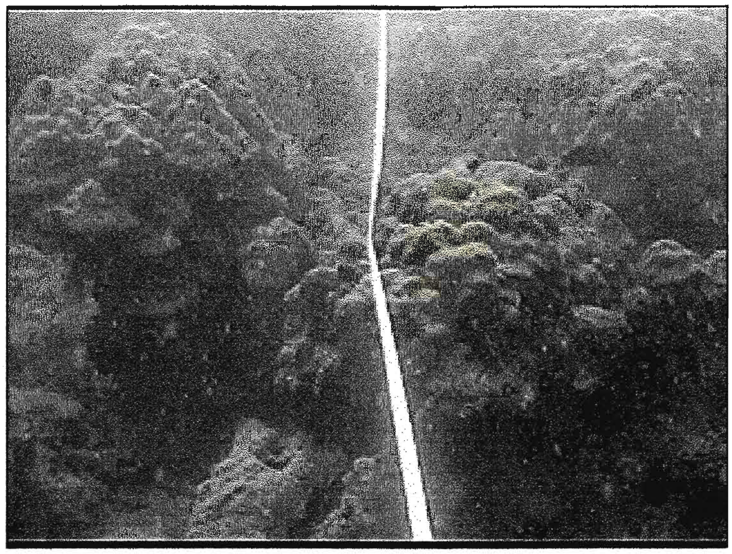

Figure 18. Coral colonies of *Porites spp.* (*P. lutea, P. australiensis and P. lobata*) the most abundant species on Sichang station 1 transects.

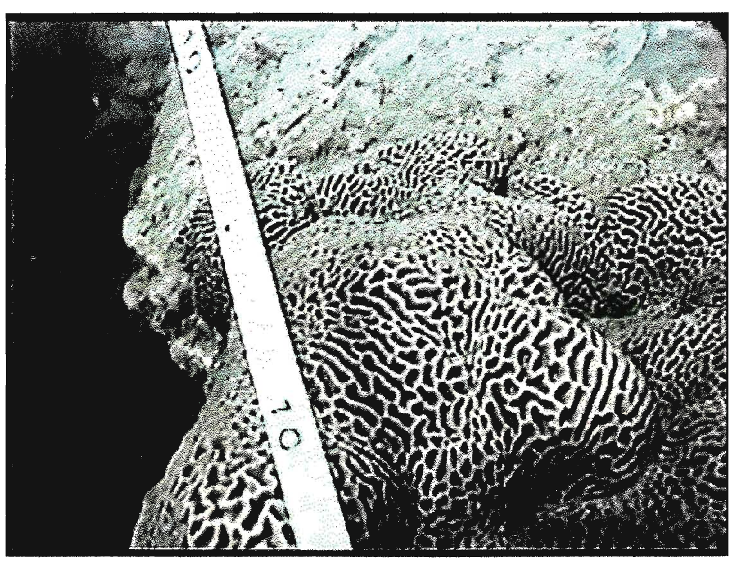

Figure 19. A colony of *Platygyra daedalea*, one of the Faviid corals.

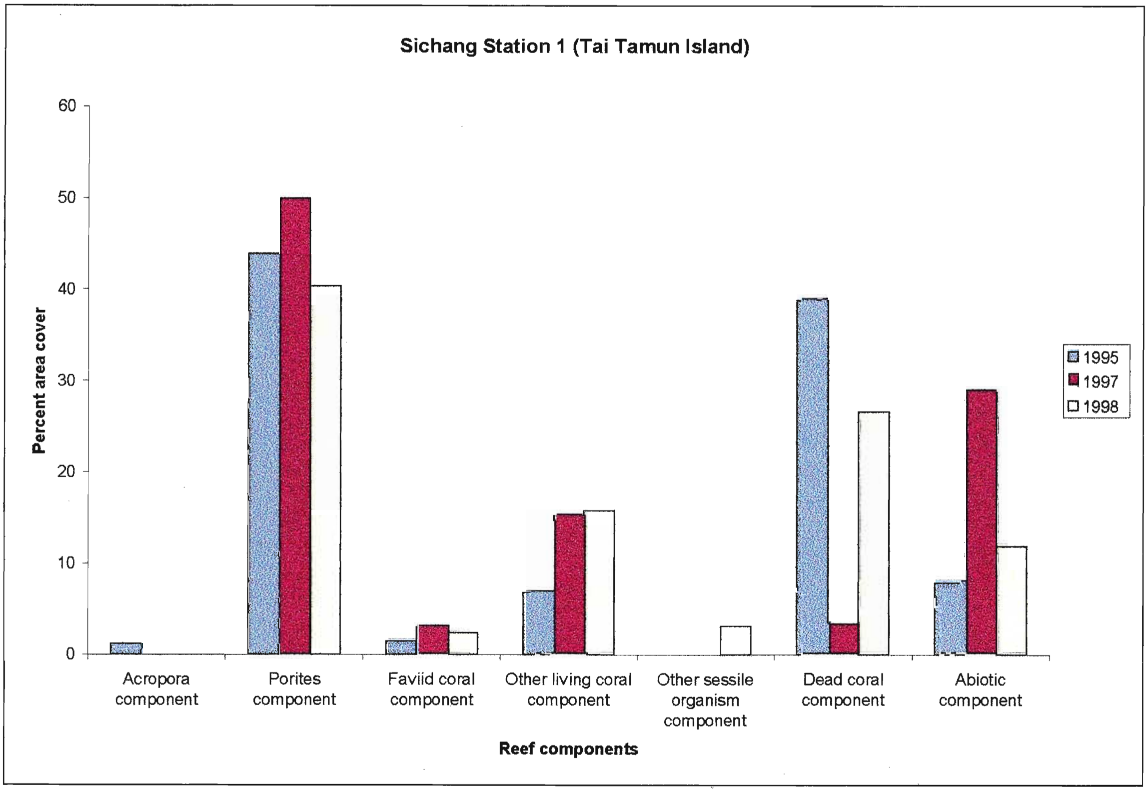

Figure 20. Percent cover of reef components on Sichang station 1 on 1995, 1997 and 1998 transects.

Sichang Station 2 (East-Side Sichang Island)

The Sichang station 2 transect is located on a small coral assemblage on the leeward, east side of Sichang main island. Just north of this station, a deep-sea port was being constructed during the study period. As well as activity on floating platforms for loading agricultural products but primarily cassava starch were producing large amounts of sediment which caused murky condition around this reef. The readings of secchi depth and sea surface temperature obtained during the field study were 5.7 m and 27° C. Salinity was 34‰.

This coral assemblage is developed on an elevation of primary, igneous rock and is surrounded by silt bottom. The coral community is dominated by corallimorphic zoantharians (colonial anemones) inhabiting almost 30% of the area (Figure 21). Most of these zoantharians belongs to genus *Zoanthus sp*. The dominant group of scleractinian corals is *Porites spp*. which cover approximately 25% of the area (Figure 24). An arborescent growth form of *Acropora formosa* was found on 7% of the transect (Figure 22) while faviid corals including *Favia maxima, F. favus,* and *Platygyra daedalea* were also found along the transects and comprised 2% of the cover (Figure 23). Seven species of scleractinian coral belonging to 4 families were recorded along this transect (Table 2).

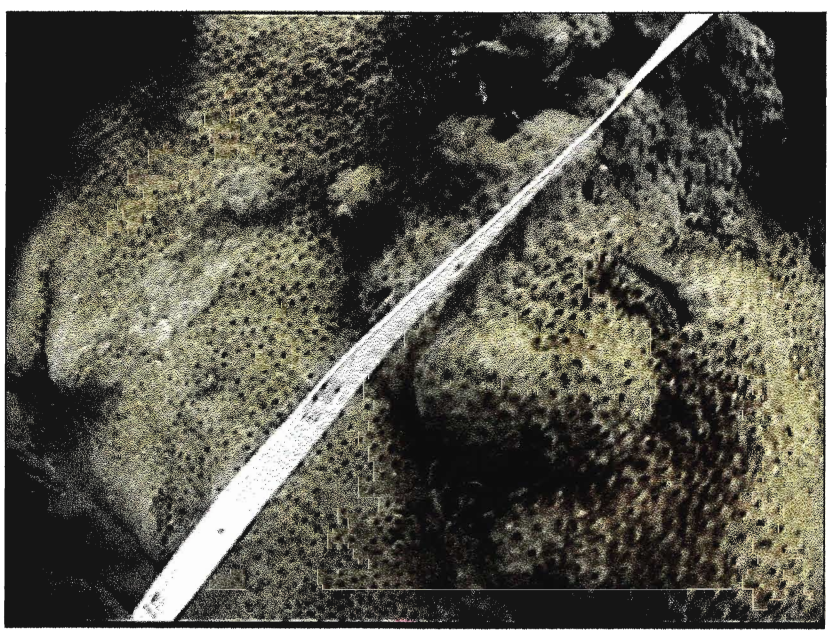

Figure 21. Colonial anemone (zoantharian) found on Sichang station 2.

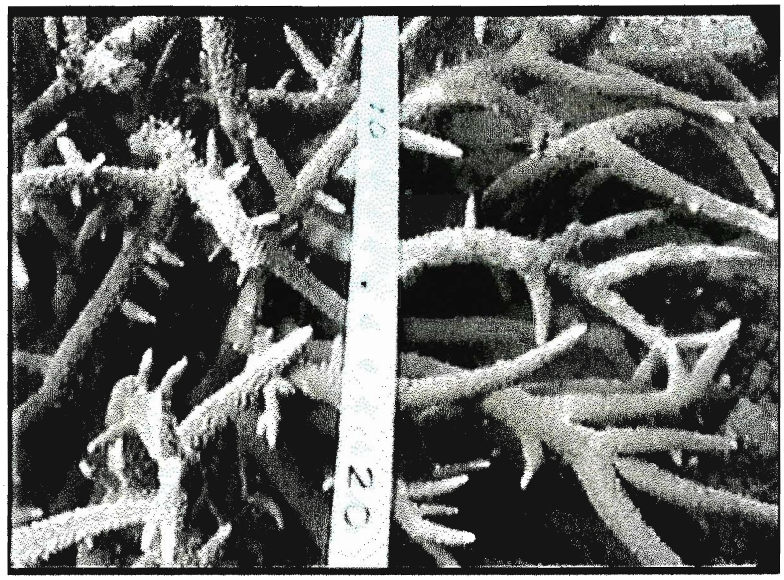

Figure 22. Arborescent form of *Acropora formosa*

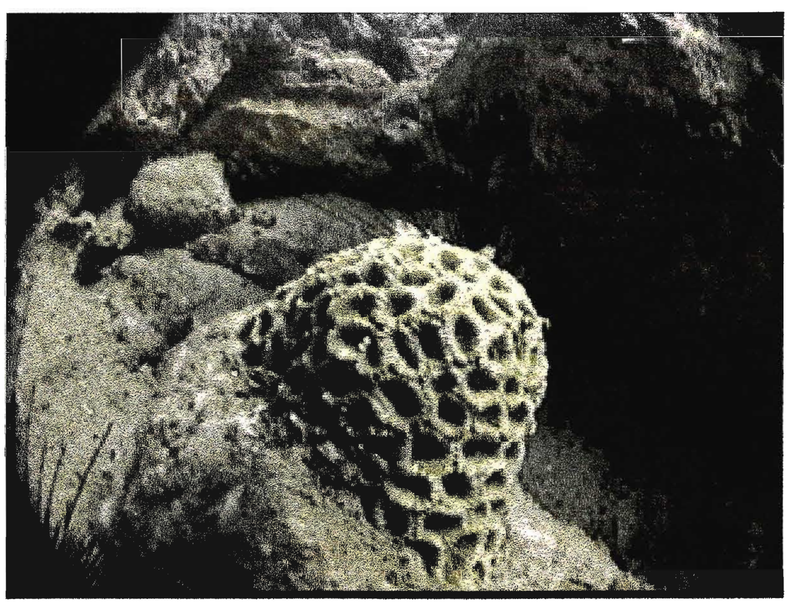

Figure 23. *Favia sp.* growing on primary igneous rock on Sichang station 2

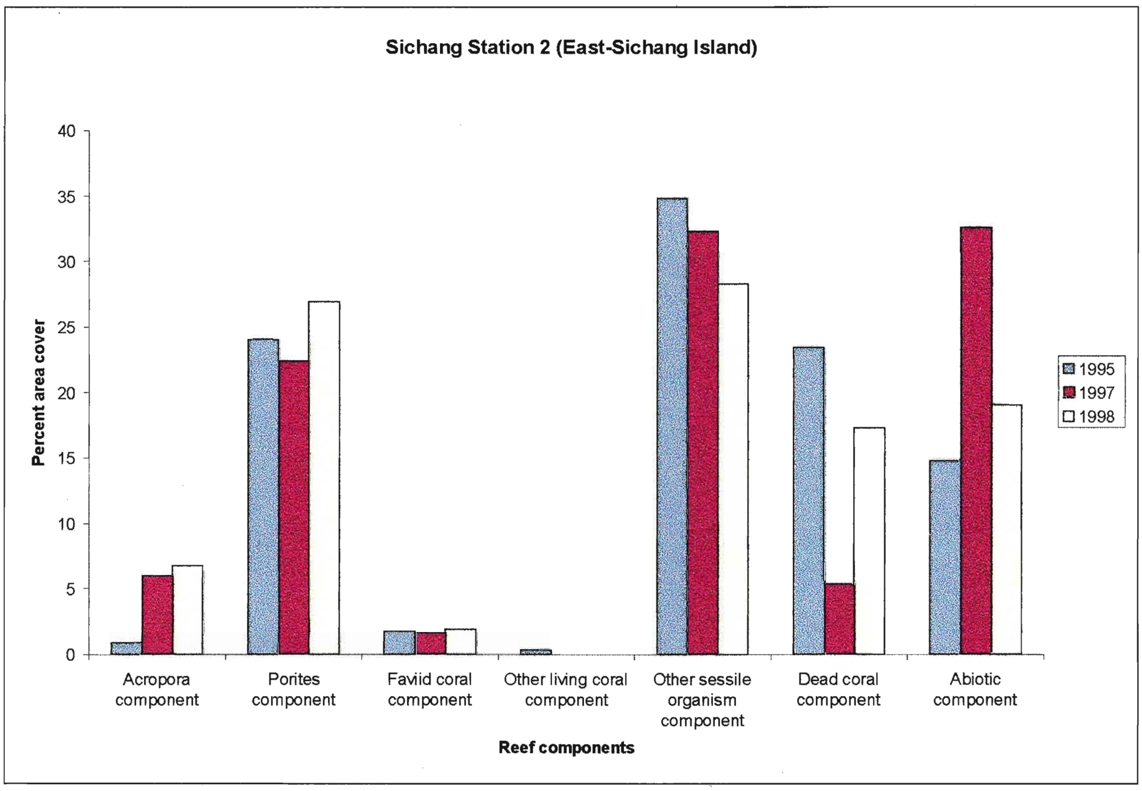

Figure 24. Percent cover of reef components on Sichang station 2 on 1995, 1997 and 1998 transects.

Sichang Station 3 (West-Side Sichang Island)

Sichang station 3 transect is situated on the fringing reef on the west side of Sichang main island. This fringing reef is developed on a primary igneous rock shelf off a steep, rocky shoreline. Soft-bottom sediment consists mainly of fragments of hard coral skeleton and various kinds of seashell debris. Occasionally, it is exposed to southwest monsoonal wind-generated waves. During the field studies, physical parameters were recorded with the secchi disc reading being 5.7 m, sea surface temperature being 27°C and salinity at the surface being 34‰.

Twenty-four species of scleractinian corals belonging to ten families were found on the line transects. The coral community of this location is dominated by *Porites spp.* which covers almost 50% of the surface area (Figure 26). The second most abundant group of scleractinians is Faviid coral covering 8% of the surface area. Faviid corals were also the most abundant in terms of number of species. Eleven species were encountered on the transects (Table 2). The corymbose growth form of *Acropora spp.* was recorded from 1.5% of the surface area (Figure 25).

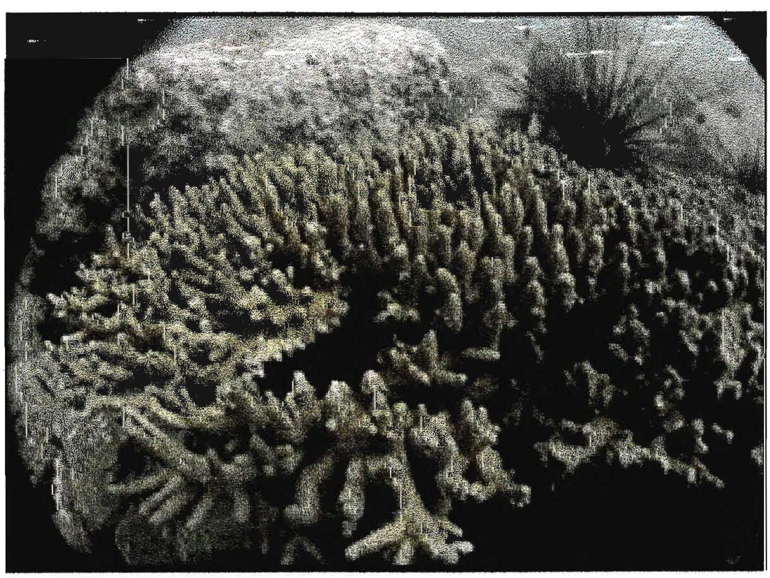

Figure 25. The corymbose growth form of *Acropora sp.* found on Sichang station 3 transect.

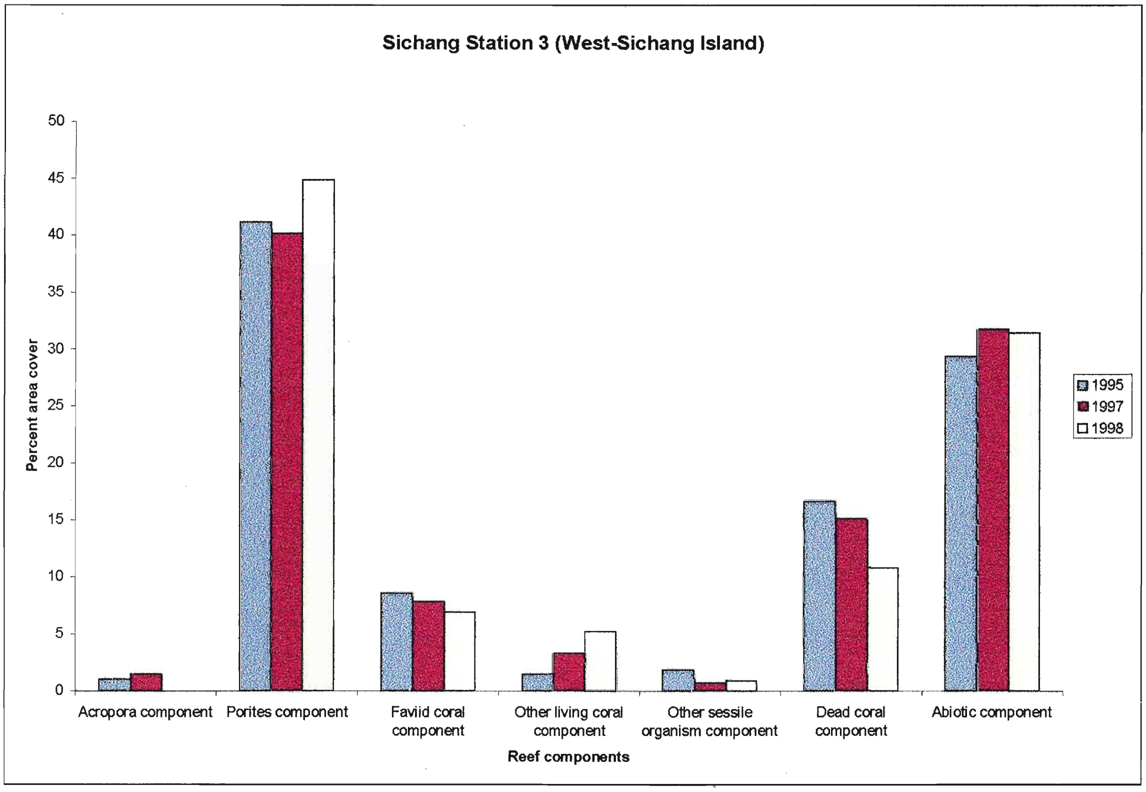

Figure 26. Percent cover of reef components on Sichang station 3 on 1995, 1997 and 1998 transects.

Sichang Station 4 (Sampanju Island)

Sichang station 4 is located on Sampanju Island just north of Sichang main island. The coral assemblage surrounding this small island is developed on primary rock outcrops. This assemblage represents the coral community closest to the upper Gulf of Thailand estuary where seasonal freshwater intrusion occurs. Physical parameters were recorded in situ. Secchi depth reading was approximately 5.4 m while sea surface temperature and salinity were 28°C and 32‰ respectively. Soft-bottom sediment is coarse-grain coral sand and fragmented seashell.

The coral community is poorly developed throughout the entire reef surrounding the island though seventeen species of scleractinian corals were found and collected on the transects. Most abundant in terms of numbers of species within a family is the Faviidae in which eight species were identified. This coral community is dominated by massive colonies of *Porites spp* (Figure 27).

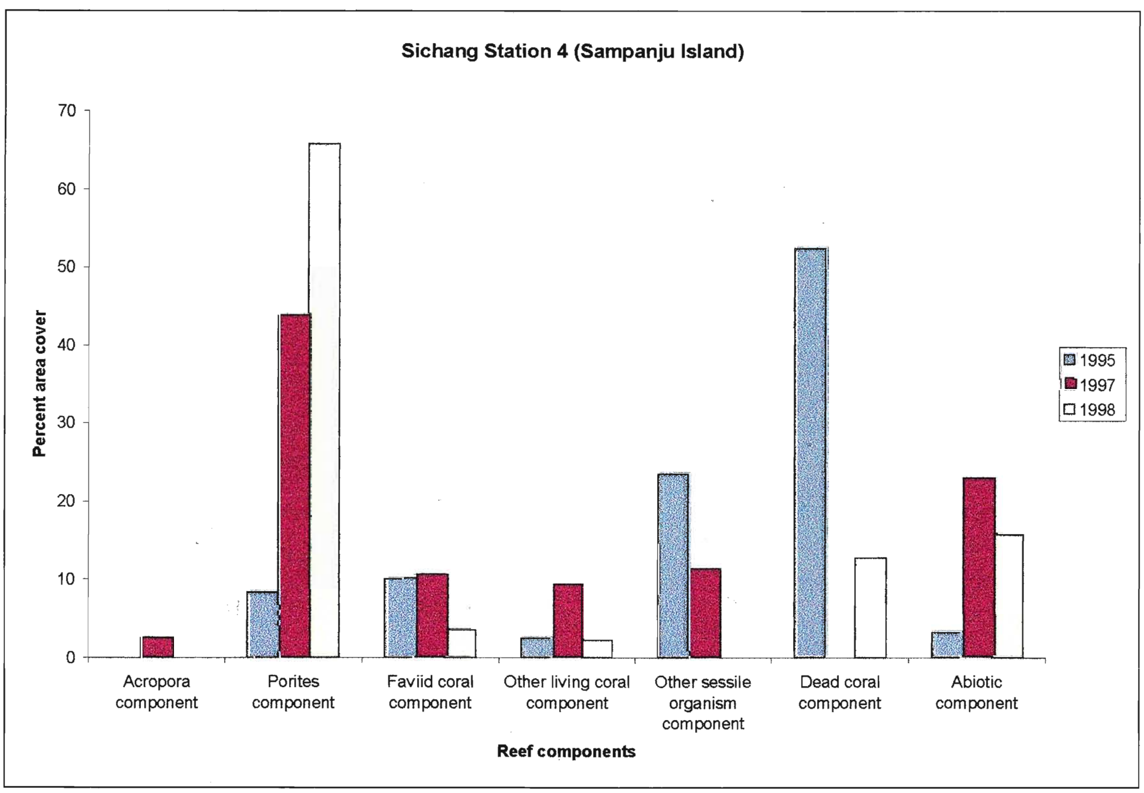

Figure 27. Percent cover of reef components on Sichang station 4 on 1995, 1997 and 1998 transects.

Faviid corals occupy 10% and other scleractinian corals including *Acropora hyacinthus*, *Pocillopora damicornis*, *Turbinaria spp.* and *Pavona sp*. account for 5% (Table 2).

The other benthic organisms sharing this reef are *Palythoa spp*. and zoanthids which comprise approximately 12% of overall area. The transect on this station was relocated in 1997. The coral community delineated in 1997 was quite different from that on the original transect. Considerable difference was noticed in *Porites spp.* in terms of both area cover and growth form. On the original transect massive forms of large *Porites* colonies comprised 8.3% of the transect. On the later transects encrusting forms and small colonies of *Porites spp.* (Figure 28) with approximate diameters of 15 to 20 cm were found on the rock bed over 43.8% of the transect.

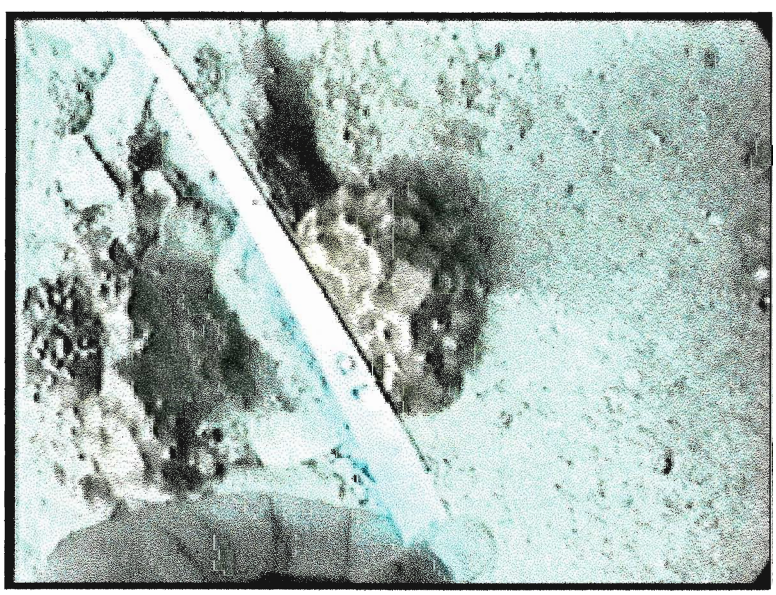

Figure 28. A new colony of Porites sp. found on Sichang station 4 in the 1998 re-examination

Sichang Station 5 (Lan Dokmai Island)

Sichang station 5 transect is situated east of Sichang main island on Lan Dokmai Island. The coral community surrounding the island is developed on sand-bottom and primary rock gravels. This reef has a similar structure to reef in Sichang station 1 in which *Porites spp.* forms heavy mounds with less-abundant species inhabiting spaces and overhangs between those *Porites* colonies. Secchi depth reading, sea surface temperature and salinity at the surface were recorded as 6.3 m, 27°C and 34‰, respectively.

Twenty species of scleractinian corals were found and collected on the line transects during the field trips. This reef is dominated by *Porites spp* (Figure 32). The common Indo-Pacific species *P. lutea, P. australiensis* and *P. lobata* occupy approximately 50% of the entire reef. The greatest abundance in terms of number of species within a family belongs to Faviid corals (Figures 29 and 30), thirteen species of which were recorded. Other scleractinian corals were found including *Goniopora djiboutiensis*, *Pocillopora damicornis* (Figure 31), *Symphyllia sp.* and *Turbinaria mollis*. No *Acropora* was encountered on this transect.

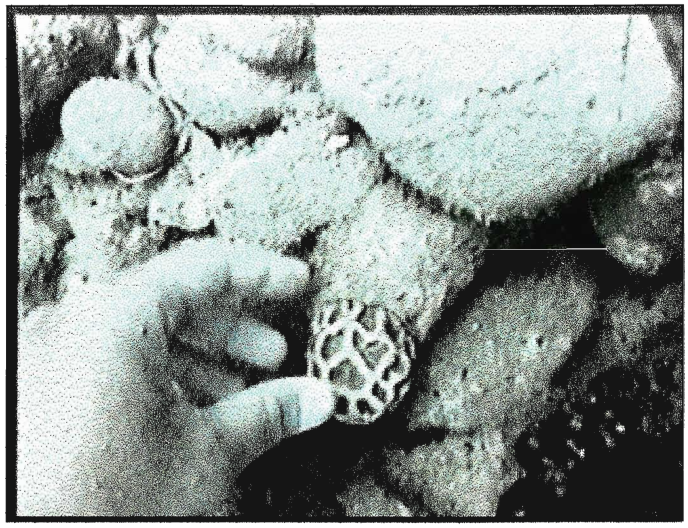

Figure 29. A colony of *Favia sp.* on primary rock gravel on Sichang station 5.

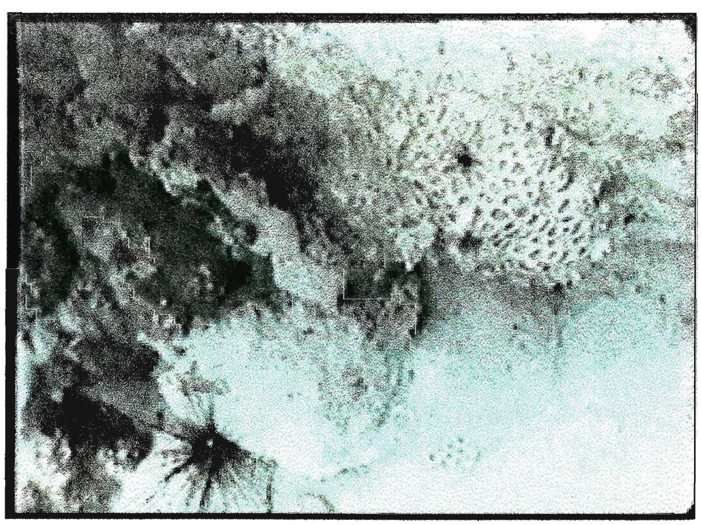

Figure 30. *Goniastrea sp.* (top right) and *Favites sp.* (bottom right).

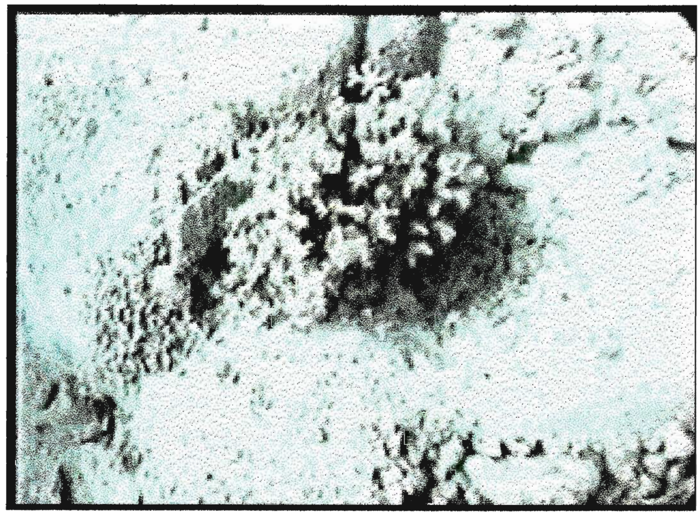

Figure 31. A colony of *Pocillopora damicornis* on dead coral substrate

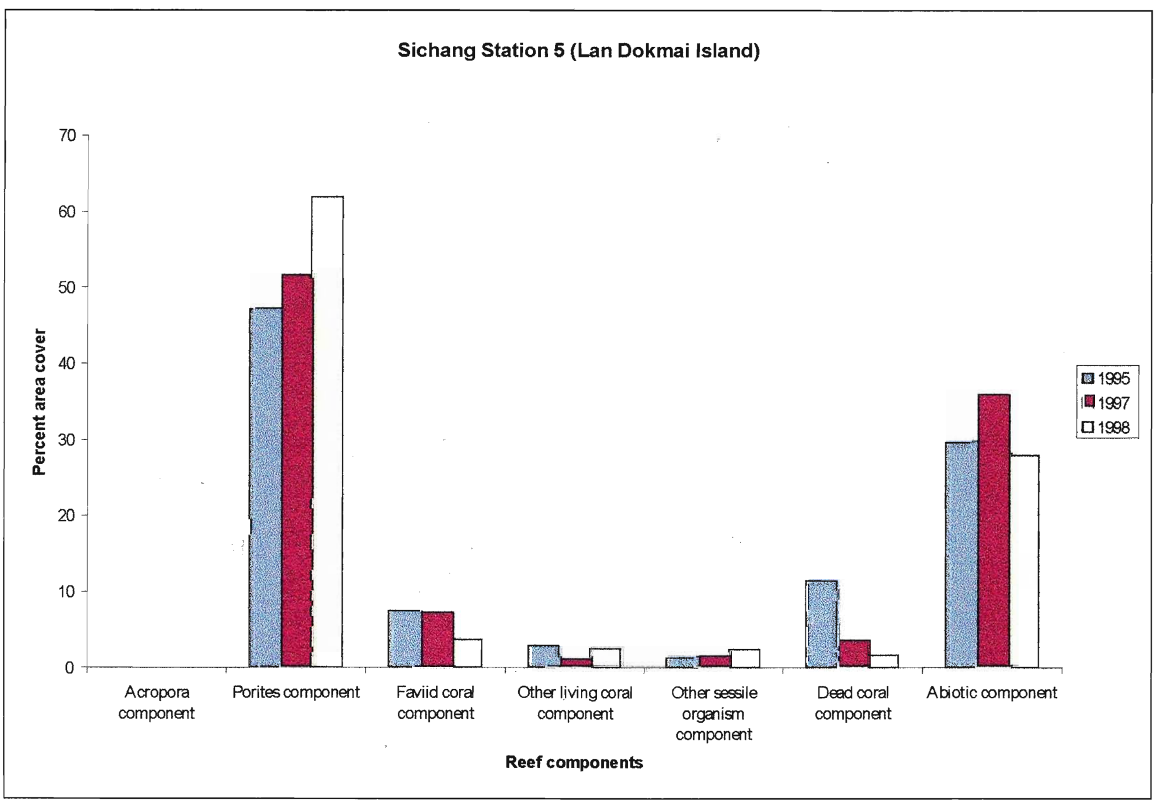

Figure 32. Percent cover of reef components on Sichang station 5 on 1995, 1997 and 1998 transects.

Pattaya Station 6 (Nok Island)

Pattaya station 6 transect is located on the coral reef on the windward side of Nok Island. This study location faces directly into southwest monsoonal wind generated waves during the wet season as is evident from the existence of a rocky beach adjacent to the coral reef while the opposite side of the island is characterized by sandy beach. The coral reef is formed on a gravel and primary igneous rock foundation. Physical parameters were measured and the secchi disc reading was 5.4 m, sea surface temperature was 29°C and salinity at the surface was 34‰.

Fifteen species of scleractinian corals were collected on the line transects during the study period. The most abundant families in terms of number of species was Faviidae with six species and the second abundant family was Acroporidae with five species found (Table 2). Other species found included *Psamocora contigua, Pocillopora damicornis* and *Symphyllia sp*. The scleractinian community is dominated by massive form *Porites* species comprising approximately 30% of the overall area. The second dominant group, *Acropora spp*. with an area cover of 10% contained mainly corymbose and arborescent forms (Figure 33). A previous study on temporal variation of coral community on this island by Chou et al. (1990) revealed that the community structure on leeward and windward sides developed as a common population with a Jaccard's similarity coefficient of 0.78. Even so, the differences between reefs represented by the 1995 transect and the 1997 transect were apparent (Figure 35). On the original transect stands of *A. formosa* and large mounds of *Porites spp.* were observed and produced area cover of 7.4% and

51.0% respectively. In contrast, the 1997 transect exhibited smaller colonies of *Acropora* and *Porites spp.* (Figures 33 and 34).

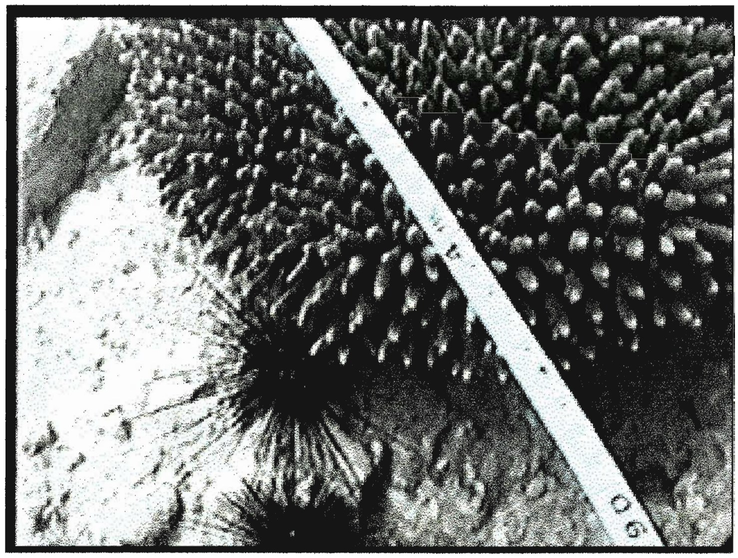

Figure 33. A colony of corymbose form of *Acropora sp.* found on Pattaya station 6.

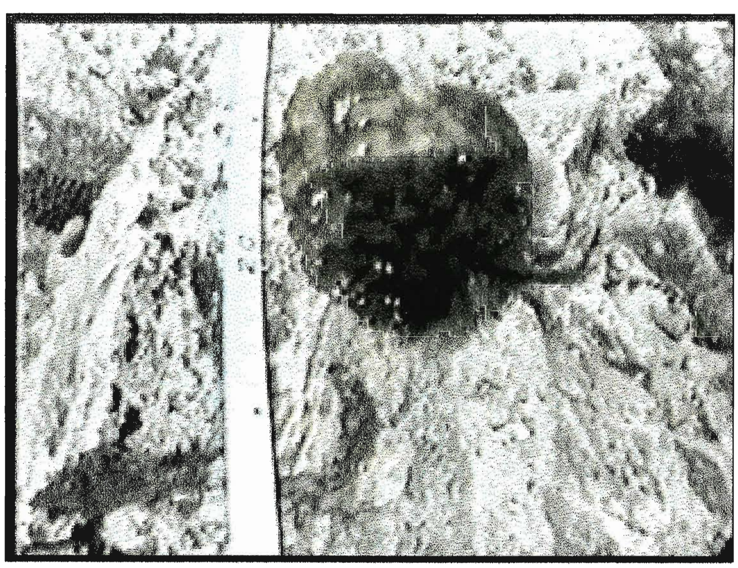

Figure 34. A small colony of *Porites sp.* colonizing primary rock substrate

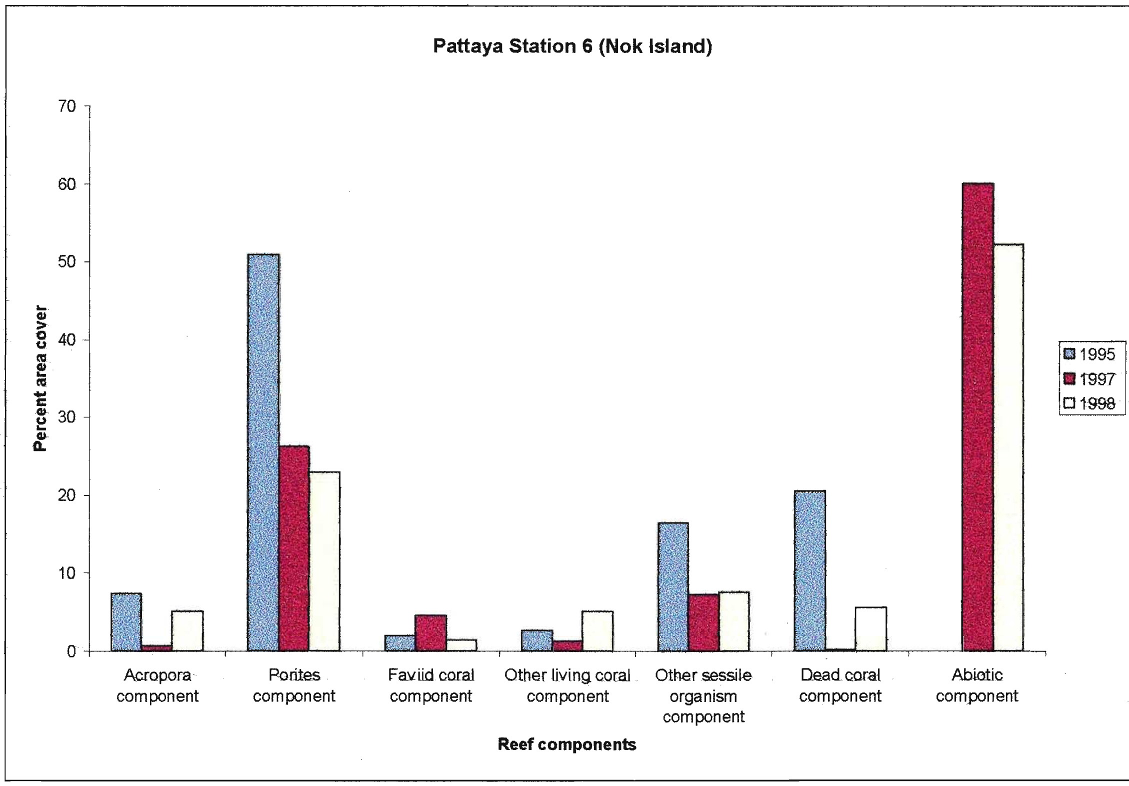

Figure 35. Percent cover of reef components on Pattaya station 6 on 1995, 1997 and 1998 transects.

Pattaya Station 7 (Krok Island)

Pattaya station 7 transect is located on the north side of Krok Island where the surrounding coral reef is characterized by a coral platform of massive *Porites spp*. The corals are found at the depth of approximately 2.0m below LLW. During the field studies, the secchi disc reading, temperature and salinity at the sea surface were 5.7 m, 27°C and 32‰, respectively.

Twenty-seven species belonging to nine families of scleractinian corals were encountered during the investigation (Table 2). This coral community is dominated by *Porites spp* in term of percent area cover (Figure 36). It comprises almost 50% of surface cover (Figure 37). The most abundant family in terms of number of within family species is Faviidae in which nine species were found covering less than 5% of overall area.

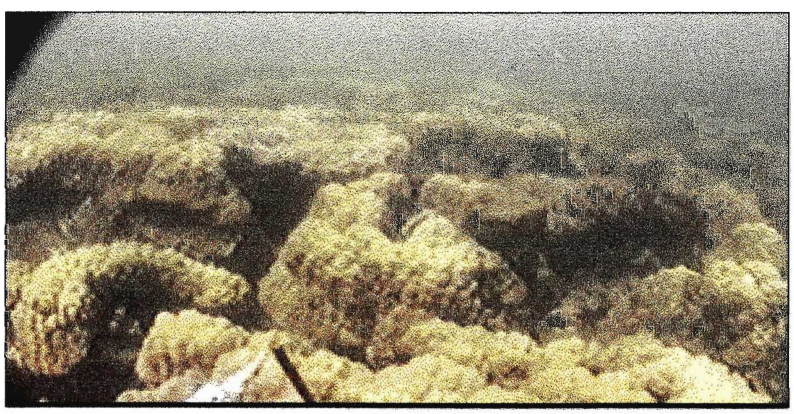

Figure 36. A platform reef on Pattaya station 7 consisting of *Porites* microatolls.

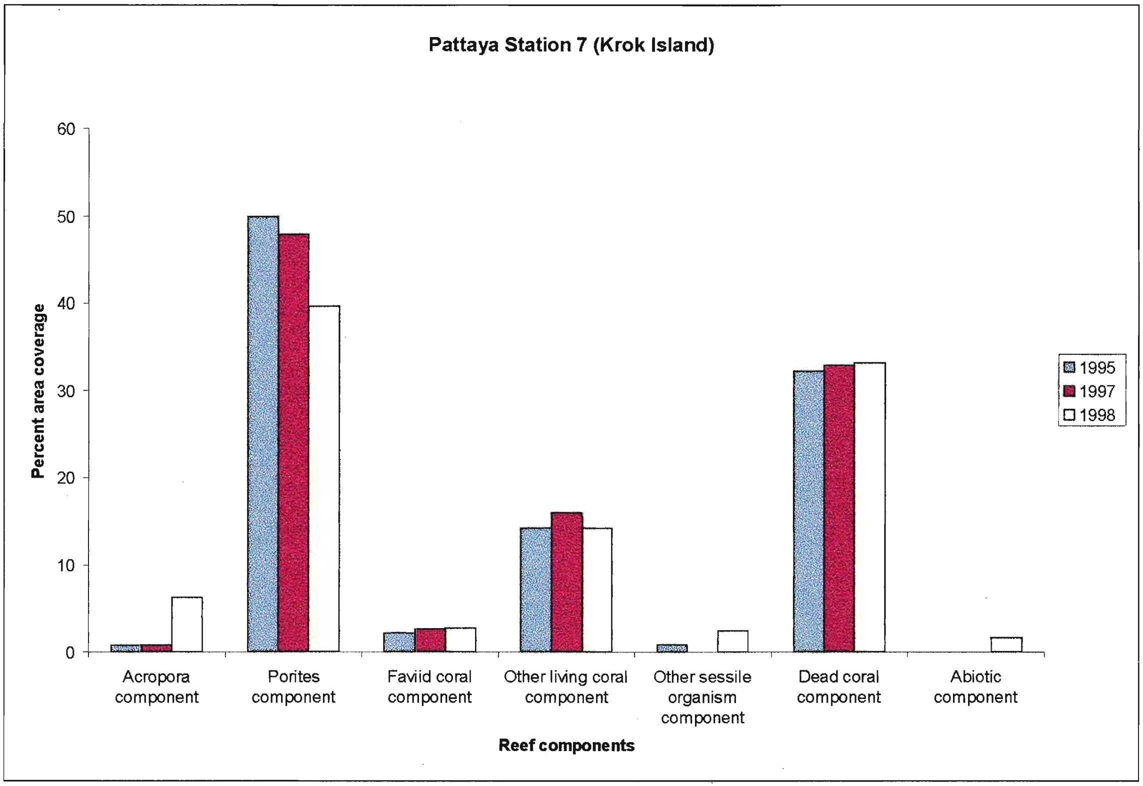

Figure 37. Percent cover of reef components on Pattaya station 7 on 1995, 1997 and 1998 transects.

Pattaya Station 8 (Lan Island)

Pattaya station 8 is situated on the west side of Lan Island where the coral reef is occasionally exposed the southwest monsoon during the wet season. This coral community is characterized by arborescent staghorn corals of the genus *Acropora* (Figures 38, 39 and 40) and extends from a depth of approximately 1.0 to 6.0 m below LLW. The transect on this station was relocated in 1997. The coral community determined from the 1997 transect was quite different from that determined on the original transect. In 1997, arborescent *Acropora* (mostly *A. formosa*) formed scattered patch reefs on the sand bottom and dead coral substrate (Figure 40) and produced an area cover only of 5.3% which was substantially less than the 45% coverage on the orginal transect. Almost 50% of the area on the 1997 transect was occupied by zoantharians primarily *Zoanthus sp.* which colonized dead coral and partially dead coral colonies on the sand bottom (Figure 41).

During field studies, secchi disc, temperature and salinity readings at sea surface were 8.4 m, 28°C and 33‰, respectively.

Thirty-two species of scleractinian corals were encountered during the investigation. The coral community is dominated by arborescent forms (mainly *Acropora formosa* and *A. grandis*) and partially by a tabulate form of *A. hyacinthus*. *Acropora spp.* covered approximately 50% of the reef on the 1995 transect. The most abundant family in terms of numbers of species within a family is also the Acroporidae with twelve species. The second most abundant family is Faviidae of which eight species were collected along the transects (Table 2).

Figure 38. *Acropora* dominated reef with high coral cover represented by the original transects.

Figure 39. *Acropora* dominated reef represented by the original transects on Pattaya station 8

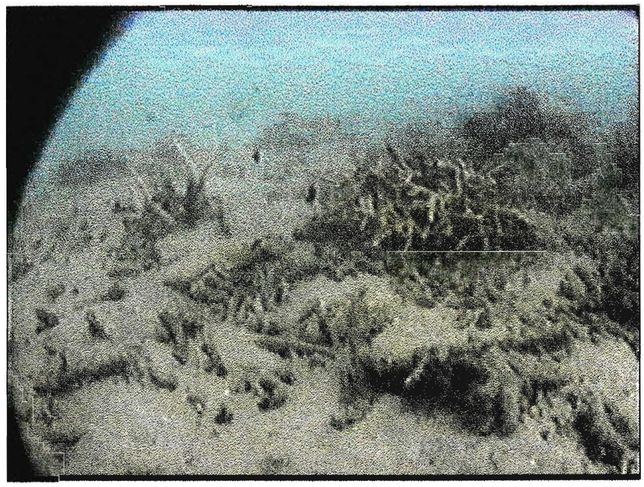

Figure 40. Patch reef of brancing *Acropora* on 1997 transect.

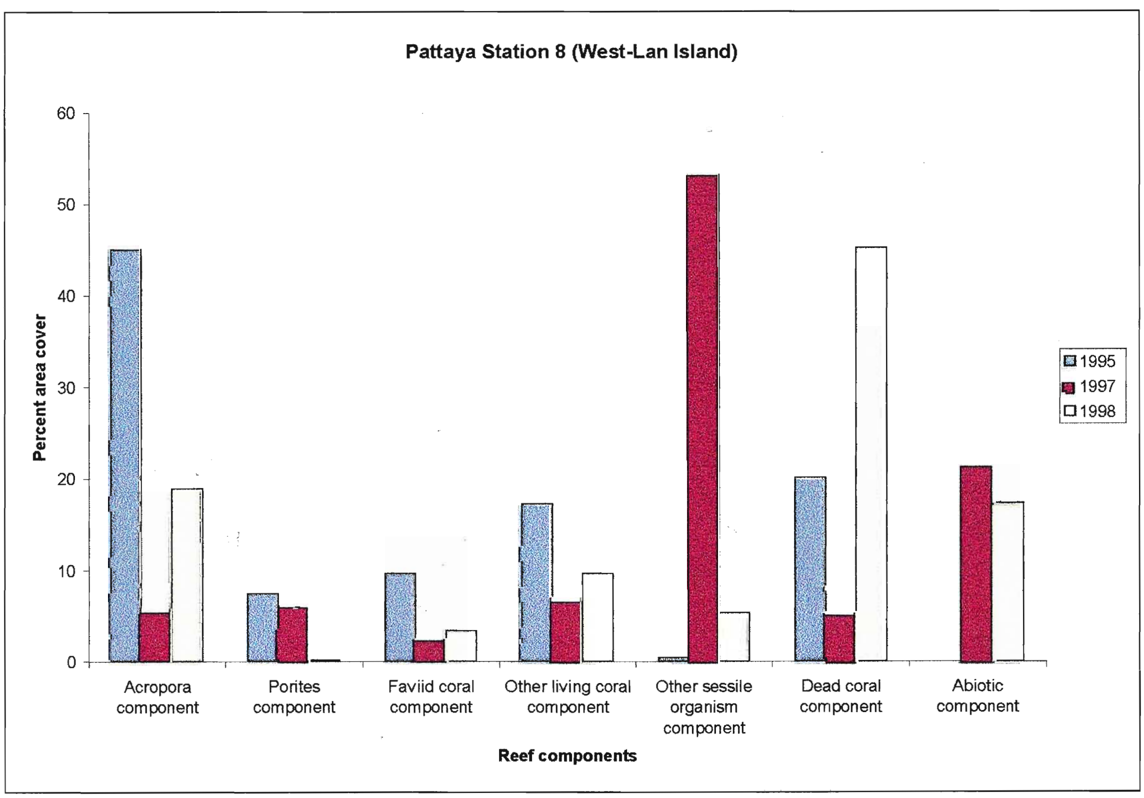

Figure 41. Percent cover of reef components on Pattaya station 8 on 1995, 1997 and 1998 transects.

Pattaya Station 9 (Jun Island)

Pattaya station 9 is situated on the coral assemblage surrounding a small island. The coral assemblage is developed at an approximate depth of 1.0 to 3.0 m below LLW under murky conditions. The physical parameters recorded during field studies were secchi depth, 4.5 m, sea surface temperature, 29°C and salinity at surface, 33‰.

In 1997 this transect was resituated. The original transect represented a reef area where *Acropora spp.* were dominant and covering 34.0% of the area. A newly laid transect in 1997 revealed a distinct coral community characterized by massive forms of *Porites spp.* that in terms of percent area cover comprised almost 40% of the reef (Figure 43). Thirty-three species of scleractinian corals were collected along the line transects (Table 2).

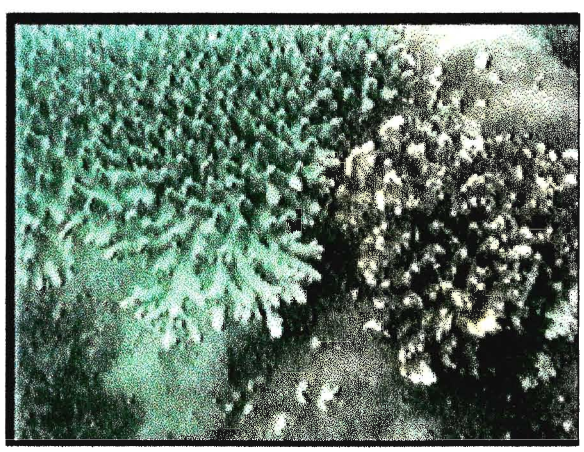

Figure 42. Common species of corals found on Pattaya station 9 (background: *Porites sp.*, left: *Acropora millepora* and right: *Pocillopora damicornis*)

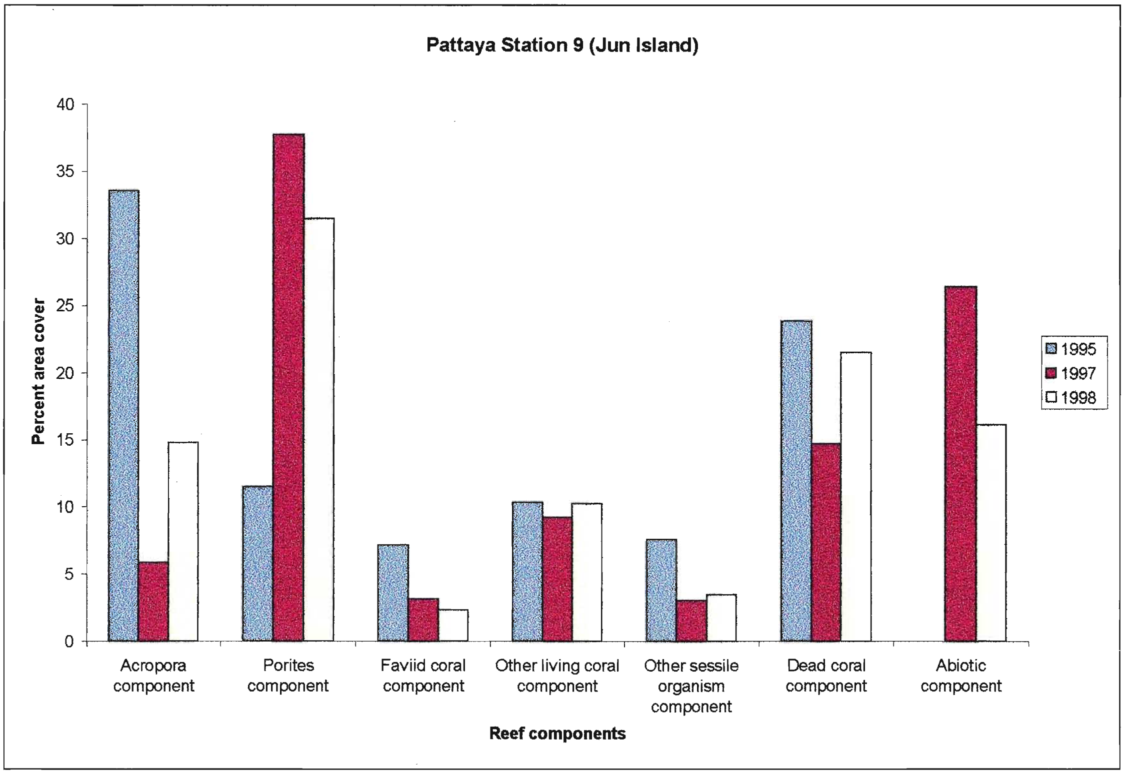

Figure 43. Percent cover of reef components on Pattaya station 9 on 1995, 1997 and 1998 transects.

Pattaya Station 10 (Sak Island)

Pattaya station 10 is located on the west side of Sak Island just north of Lan Island. Coral colonies on this side of the island were found scattered partially on sand-bottom and on a calcified rock platform. The reef extends from the depth of 2.5 to 5.0 m below LLW. Physical parameters recorded during the field investigation include secchi disc reading, temperature and salinity at the sea surface. These were 5.7 m, 29°C and 33‰, respectively.

Twenty-one species of scleractinian corals belonging to nine families were encountered along the line transects. This coral community is characterized by massive colonies of *Porites spp*. (*P. lutea, P. lobata* and *P. australiensis*) which comprise approximately 25% of area covered (Figure 45). The most species abundant family is the Faviidae in which nine species were identified (*Favia favus, F. maxima, Platygyra daedalea, P. sinensis, P. lamellina, Leptoria phrygia, Goniastrea retiformis, G. favulus* and *Echinopora lamellosa*). Other scleractinians including *Acropora millepora, A. formosa* and *Montipora spongodes* (Figure 44) occupied approximately 30 % of the reef (Table 2).

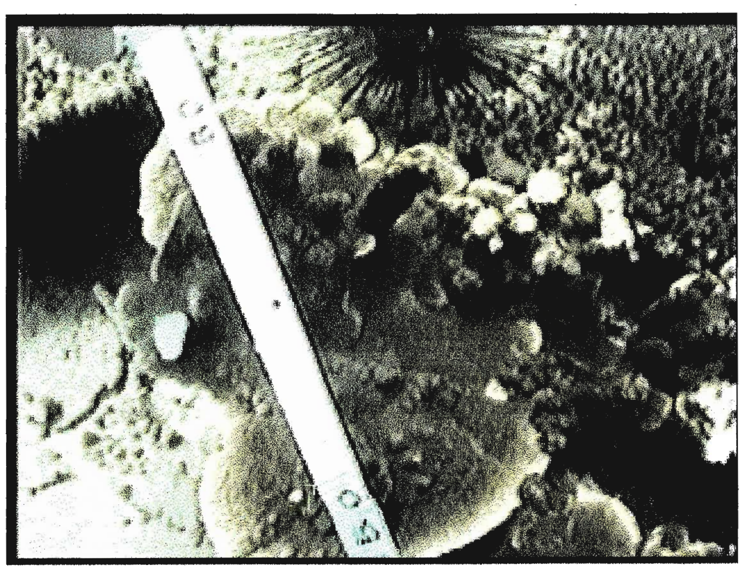

Figure 44. A colony of *Montipora spongodes*

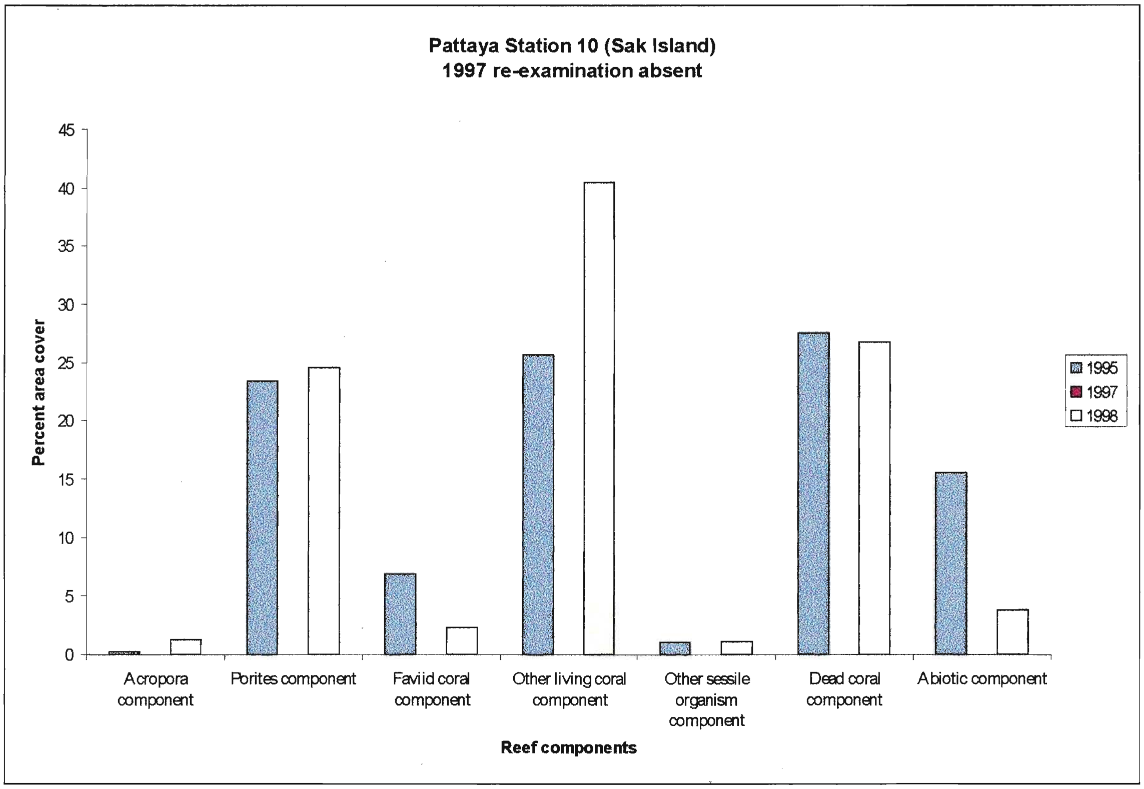

Figure 45. Percent cover of reef components on Pattaya station 10 on 1995 and 1998 transects.

Sattahip Station 11 (Kham Island)

Sattahip station 11 is located on the northwestern side of Kham Island. The well-developed fringing reef on this side of the island is characterized by various species of *Acropora spp.* of mostly arborescent growth forms (Figure 46). The coral reef extends from the depths of 2.0 to 7.0 m below LLW. Physical parameters recorded included secchi disc reading, temperature and salinity at the surface and were 5.1 m, 29°C and 33‰, respectively. Thirty-five species of scleractinian corals belonging to eight families were found along the transects (Table 2). In 1997, there was noticable change in this coral community (Figure 49) in that an area previously covered by arborescent *Acropora* was taken over by solitary fungiid corals (Figures 47 and 48).

Figure 46. Common branching growth forms of *Acropora spp.* found on Sattahip station 11.

Figure 47. The reef area covered by solitary fungiid corals.

Figure 48. *Fugia echinata*, an example of solitary fungiid corals

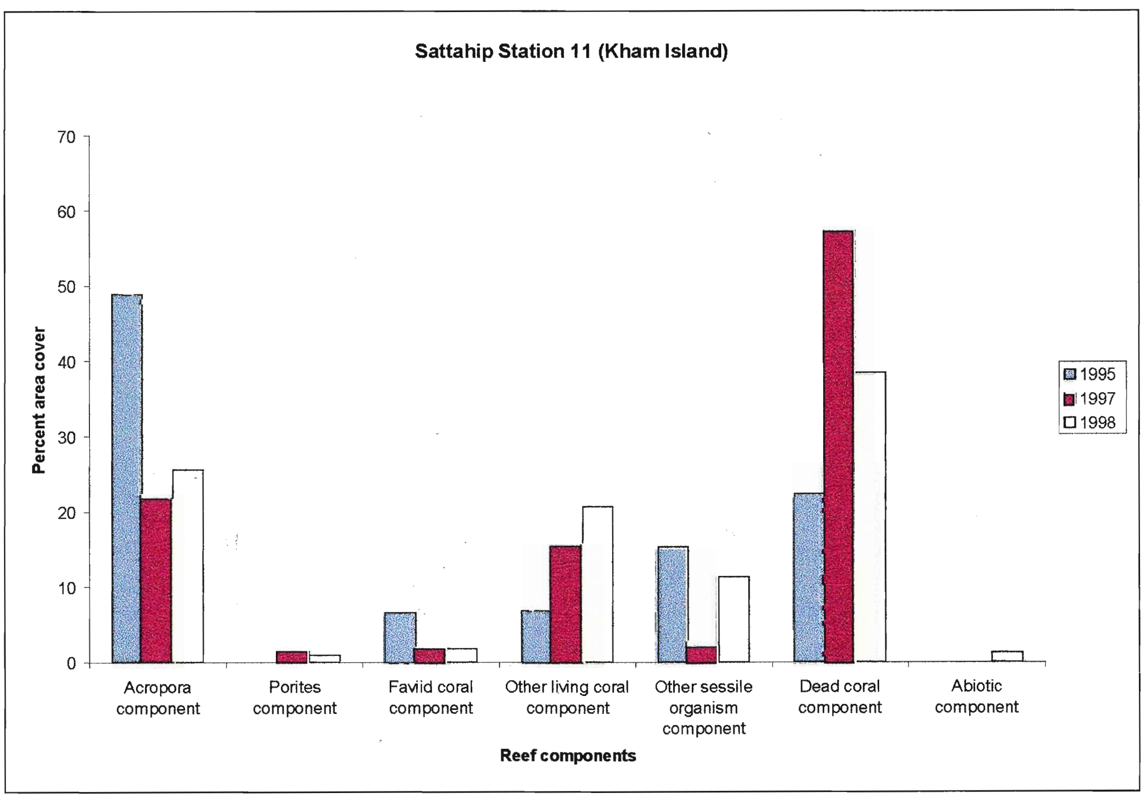

Figure 49. Percent cover of reef components on Sattahip station 11 on 1995, 1997 and 1998 transects.

Sattahip Station 12 (Yoh Island)

Sattahip station 12 is located on the west side of the island with a high density aggregation of scleractinians at depths ranging from 2.0 to 5.0 m below LLW. On this side of the island the coral reef is exposed directly to strong tidal current and occasionally to waves generated by southwest monsoon wind during the wet season. Physical parameters were recorded with Secchi depth reading, temperature and salinity at sea surface being 5.4 m, 29°C and 33‰, respectively.

This transect location is characterized almost entirely by a platform of tabulate growth forms of *Acropora spicifera* and *A. hyacinthus* (Figure 50) though arborescent forms of *A. formosa, A. grandis* were also found. Competition for space between *Acropora* and other coral species was apparent in this location (Figures 51 and 52). There was a 10% increase in *Acropora* between 1997 and 1998 (Figure 53). Twenty-four species of scleractinian corals belonging to six families were encountered on the transects. Most abundant in terms of number of within family species was the Acroporidae in which thirteen species were identified. Six species of Faviidae occurred on this transect. Other scleractinians including *Fungia fungites, Pavona lata* and *Pocillopora damicornis* were encountered (Table 2).

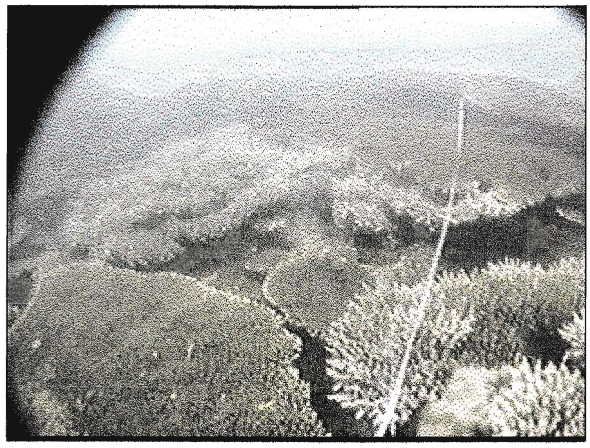

Figure 50. Tabulate forms of *Acropora* found on Sattahip station 12.

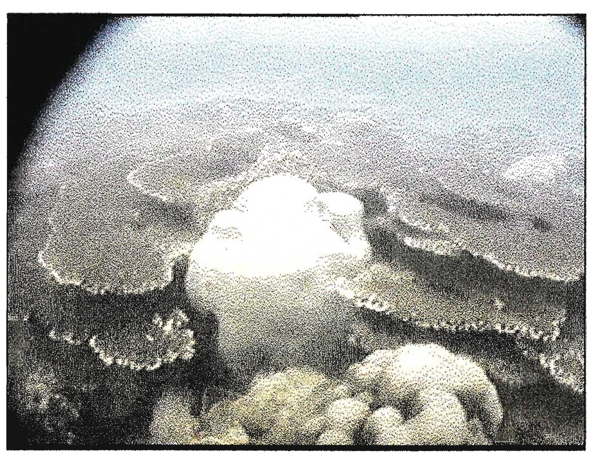

Figure 51. Colonies of massive coral being overgrown by tabulate *Acropora.*

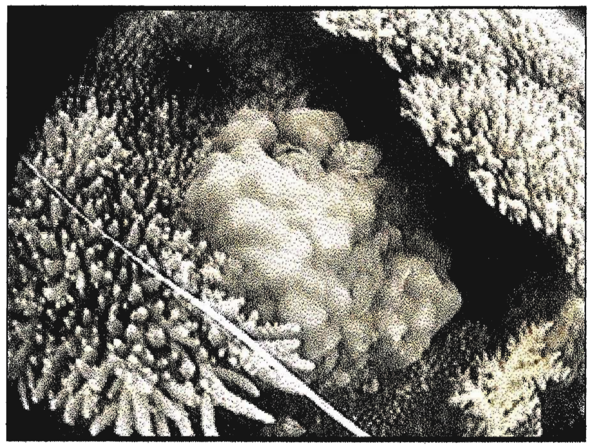

Figure 52. A colony of *Porites sp.* being overgrown by tabulate *Acropora.*

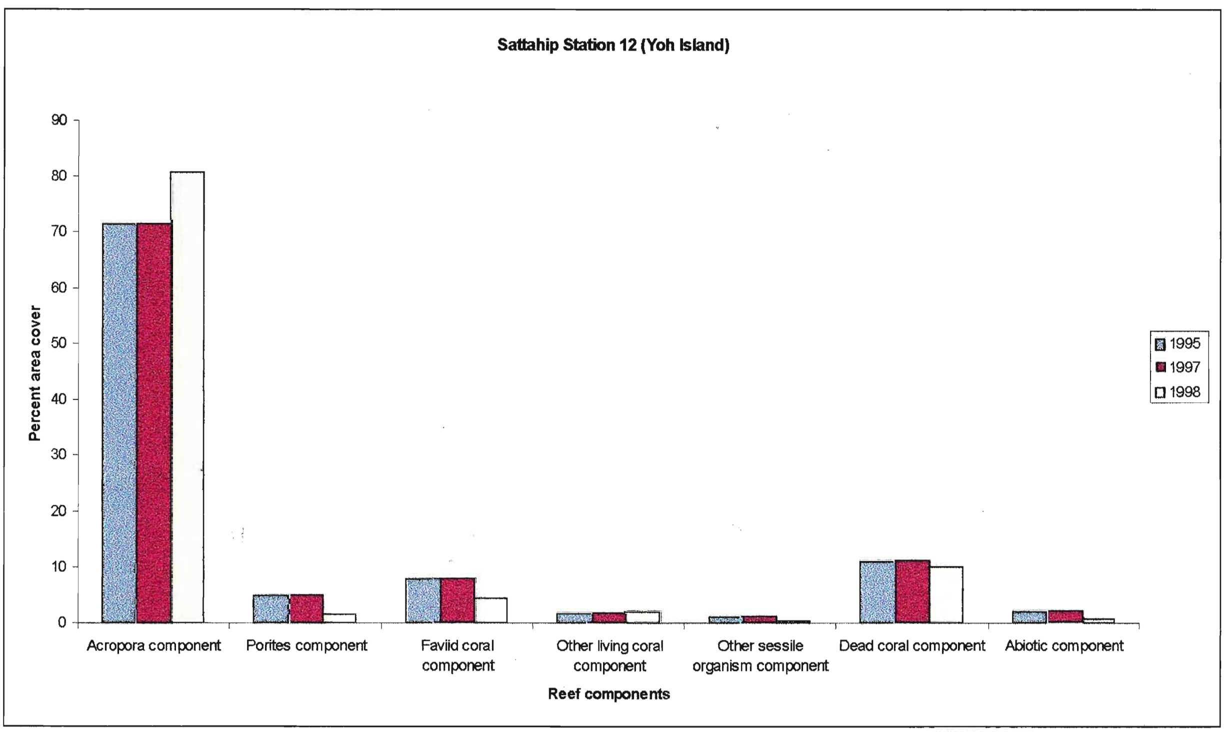

Figure 53. Percent cover of reef components on Sattahip station 12 on 1995, 1997 and 1998 transects.

Sattahip Station 13 (Samaesan Island)

Sattahip station 13 is located on the northwest side of Samaesan Island where the coral fringing reef was found to be in poor condition. Coral colonies were scattered and patchy on a sand-bottom and on coral debris composed mostly of dead branching corals (Figure 54). The coral reef occurs at depths ranging from 2.0 to 3.0 m below LLW. Secchi disc reading, temperature and salinity at the sea surface were 4.8 m, 30°C and 32‰, respectively.

Thirty species of scleractinian corals were encountered along the transects. Four species consisting of *Acropora humilis, Astreopora ocellata, Montipora tuberculosa* and *M. incrassata* belong to the Family Acroporidae and thirteen species belong to the Family Faviidae. This coral community is dominated by massive colonies of *Porites spp* which comprise 6.3% of the overall area while other living corals cover approximately 5.8% (Figure 55). The most common growth form of corals observed on this location is massive. Though the transect on this station was re-established in 1997 there was no apparent difference in terms of percent cover of reef components between the reef area represented on the original transect and that represented by the 1997 transect.

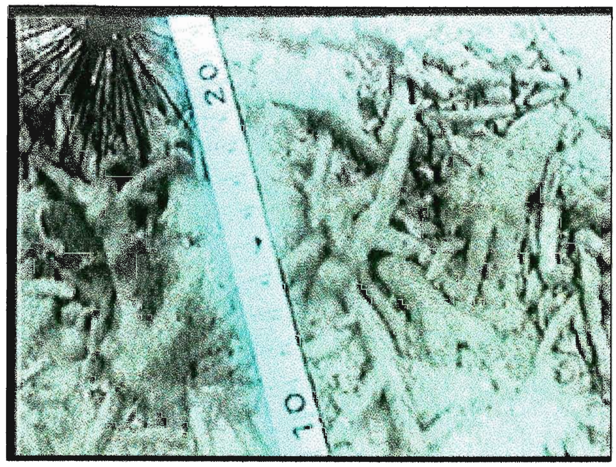

Figure 54. Dead coral component consisting primarily of dead branching *Acropora*

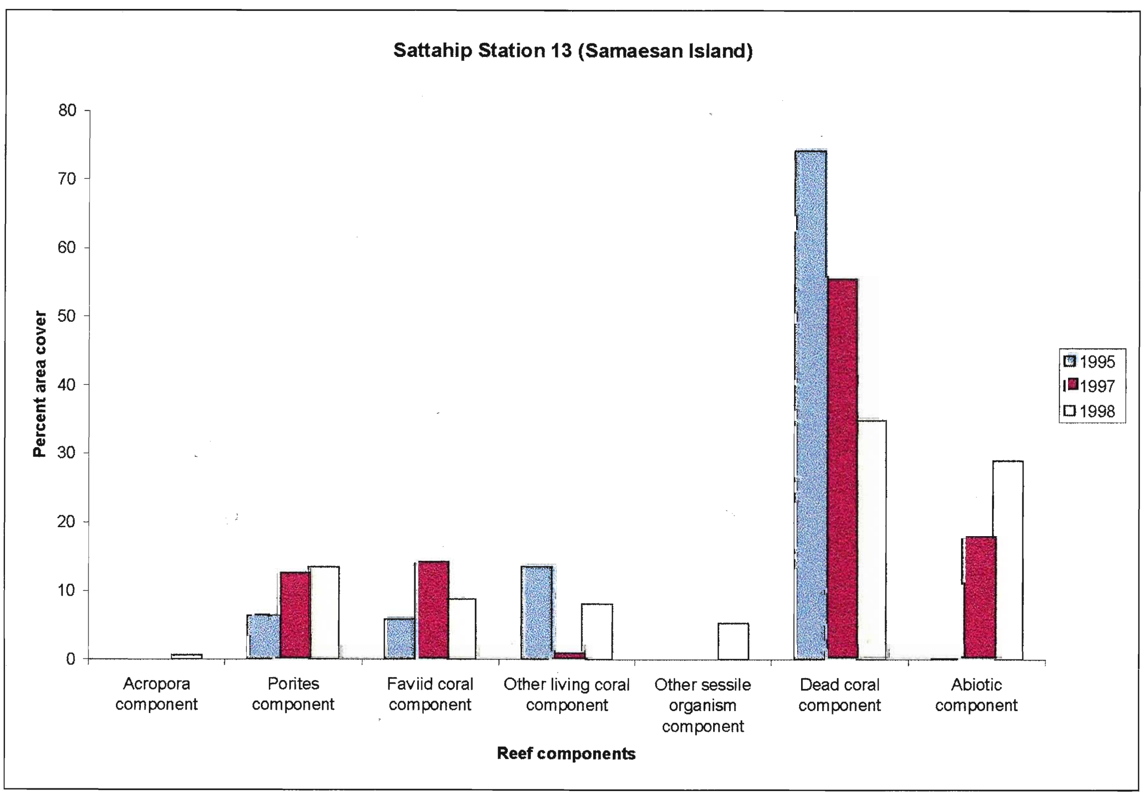

Figure 55. Percent cover of reef components on Sattahip station 13 on 1995, 1997 and 1998 transects.

Sattahip Station 14 (Raet Island)

Sattahip station 14 is located on the northwest side of Raet Island. The coral reef is developed around the island approximately 35 m away from the shoreline at a depth of 2.5 m below LLW. Secchi disc reading, temperature and salinity at the surface were 5.4 m, 29°C and 33‰, respectively.

This fringing reef is characterized by massive colonies of *Porites spp*. Forty percent of the reef area is covered by dead coral and coral debris (Figure 56). Eighteen species of scleractinian corals belonging to six families were identified (Table 2). There was no substantial difference between reef areas on 1995 and 1997 relocated transects in terms of species composition and area coverage.

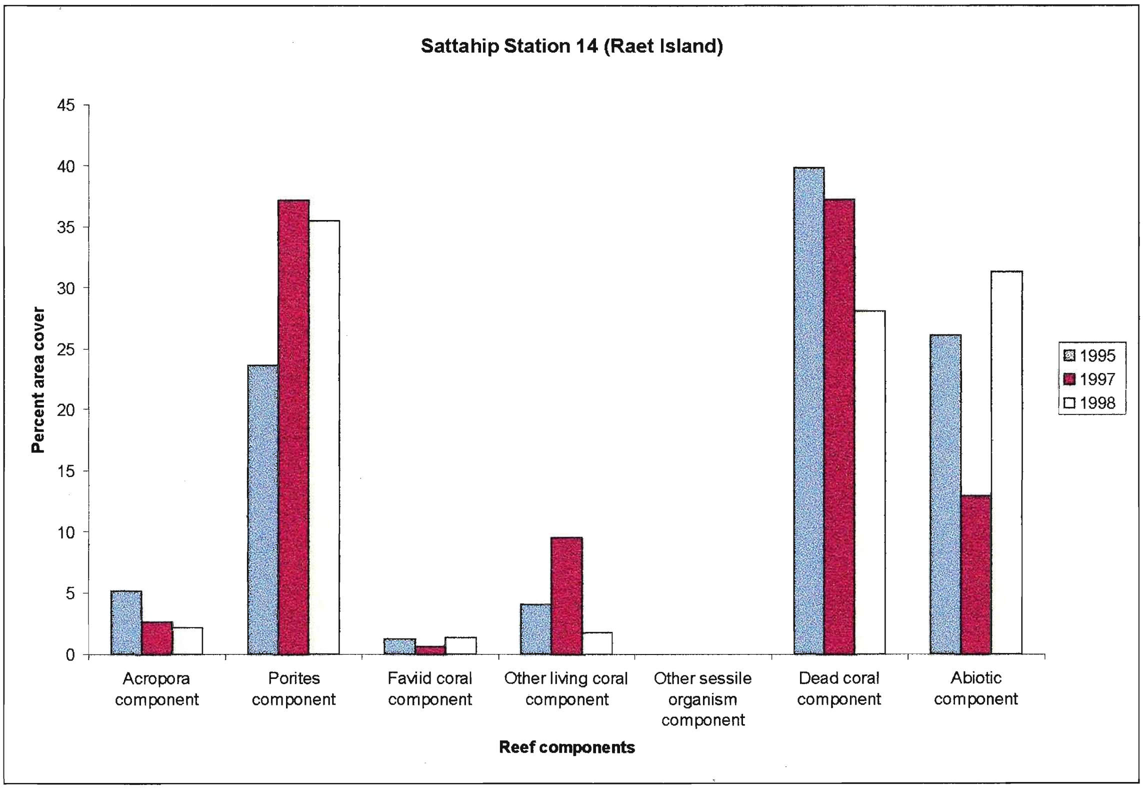

Figure 56. Percent cover of reef components on Sattahip station 14 on 1995, 1997 and 1998 transects.

DISCUSSION

PART A: DISTRIBUTION OF SPECIES, SPECIES DIVERSITY AND COMMUNITY TYPE

The coral reefs examined in this study are developed under turbid water conditions caused partially by high turbidity freshwater run-off from four major rivers located in the uppermost area of the Gulf of Thailand (Veron, 1995; Sudara, 1991) and by sediment resuspension in areas where reefs have been developed in shallow water. In addition, salinity and sedimentation gradients are expected in the inner Gulf of Thailand with lowest salinity and highest sedimentation rates in the northernmost area of the gulf (NRCT, 1998 and pers. obs.). Researches done in the Gulf of Thailand have dealt with community structure and adaptability of some coral species under conditions of sedimentation and low salinity (Moberg et al., 1997; Sakai et al., 1986; Sirirattanchai et al., 1983a; Sudara et al. 1991a; Sudara et al. 1991b; Sudara et al. 1992). None have examined the overall distribution pattern with respect to sedimentation and salinity gradients.

A total of eighty-seven species of scleractinian corals belonging to eleven families were recorded on the transects of these fourteen study sites. Numbers of species ranged from a low of seven on station 2, East-Sichang Island to a high of thirty-five on Sattahip station 11, Kham Island. Three species of *Porites,* namely *P. australiensis, P. lobata* and *P. lutea* are the common species occurring throughout the study locations. They exhibit relatively high percent area coverage on the islands in the Sichang Region and Raet and

Samaesan Islands in the Sattahip Region. One additional species of *Porites, P. lichen,* was found only in Samaesan and Raet Islands. On some reefs corals of the Family Acroporidae are abundant. Thirty-four species of acroporid corals including those in the genera *Acropora, Montipora* and *Astreopora* are found on the reefs in the Vicinity of Pattaya and Kham and Yoh Islands in the Sattahip Region. The most common species are *Acropora formosa, A. grandis, A. hyacinthus, A. millepora, A. humilis* and *Montipora efflorescens.* Twenty-five species of Faviid corals were found. In particular, one or more of *Platygyra sinensis, P. daedalea, P. lamellina, Favia favus, F. speciosa* and *Favites abdita* were sparsely scattered on every transect. *Pocillopora damicornis* was also common but found with a relatively small percent cover. Other species of corals in the families Siderastreidae, Agariciidae, Fungiidae, Oculinidae, Mussidae, Merulinidae and Dendrophylliidae were found in small numbers.

According to Veron (1986) the Acroporidae is the largest and most important family of reef-building corals. Higher numbers of acroporid species occurred in most areas within the Vicinity of Pattaya and the Sattahip Region whereas *Porites spp.* predominate on the reefs in the Sichang Region. The lower diversity of *Acropora* and *Montipora* on most study reefs in Sichang Islands may be due to lowered light intensity caused by sedimentation and eutrophication and direct impact of sediment itself. These conditions occur around the Sichang Islands (NRCT, 1998). Domestic waste from local villages, previous damage by dynamite fishing and military exercise may be responsible for the low diversity of these genera on stations 13 and 14 within the Sattahip Region.

Success in reef domination by *Porites spp* in the Sichang Islands and in Samaesan and Raet Islands is considered to be a result of the ability of *Porites spp.* to tolerate low salinity, high sedimentation and eutrophication (Moberg et al. 1997 and Sudara et al. 1991). Achituv and Dubinsky (1990) suggested that seasonal low salinity due to flood run-off from land and river discharge prevents reef development on local and regional scales but especially in the vicinity of river outlets. The same applies to sedimentation. Effects of water turbidity and sedimentation on the community structure of Puerto Rican corals (Loya, 1976) revealed an inverse relationship between coral diversity and water turbidity. The classification of coral communities determined by cluster analysis suggests that differences in community structure between study locations may be a result of the differences in salinity, water turbidity and sedimentation rate which are associated with distance from the mouths of the four main rivers (i.e., Mae Klong, Tha Chin, Chaopraya and Bangprakong Rivers) located in the northernmost gulf. In addition, although terrigenous sediment from river mouths may not be transported by force of freshwater discharge to the locations where coral reefs occur, water currents generated by monsoonal wind move fine sediment toward the reefs. Sediment resuspension by wave action also produces relatively more turbid water in shallower reef areas of the Sichang Islands than in deeper reef areas of Pattaya and Sattahip regions (pers. obs.).

Species richness noted in this investigation does not differ greatly from that reported in the previous taxonomic study of stony corals in the Gulf of Thailand by Jirawat (1985) in which ninety species belonging to fourteen families were found. Sakai et al. (1986) reported eighty-five species of scleractinian corals in the Sichang Islands and

Srithunya et al. (1981) reported sixty species of scleractinian corals in Lan Island, Vicinity of Pattaya. Almost as many species as found by Jirawat (1985) were encountered in the present transect series. This indicates that line transects record most of species that occur in the study areas. These series of transects were laid on the shallow upper portion of reefs and recorded almost as many species as were recorded by Jirawat (1985) in a much more systematic survey.

The estimated number of species in the Gulf of Thailand is, however, significantly less than the approximation of one hundred and eighty-three species for the Andaman Sea on the west coast of the Thai-Malay Peninsula (Ditlev, 1976; Phongsuwan, 1994). The lower number of species in the Gulf of Thailand is presumably because of the geographical structure of the gulf which forms a shallow, semi-enclosed basin that hampers the internal water mass from mixing well with the body of oceanic water. This has been presumed to limit the dispersal of planktonic planula larvae into the Gulf of Thailand (Sudara, Thamrongnawasawat and Sookchanuluk, 1991). Veron (1995) also stated that the sedimentary regime is largely responsible for the low coral species diversity in the Gulf of Thailand. Hubbard (1997) showed that excess sedimentation can also discourage the settlement of coral larvae. This in turn, would reduce species diversity on the reefs. Roy and Smith (1971) proposed that on Fanning Island, the increased vulnerability of young corals to sediment damage was more of a limiting factor than available space. All sedimentation related factors can act together to exert a significant natural control on the distribution of corals and their diversity. Hubbard (1986) indicated that, on the local scale, the presence or absence of an updrift source of sediment exerts perhaps the greatest control on the location and character of reefs on the north coast of St. Croix.

On the regional scale, distinctive coral communities on the study areas are a reflection of the adaptability of coral species to different natural environments and anthropogenic disturbances. In reference to results from cluster analysis, *Porites* corals that characterize the Group 1 reefs are known to be much more tolerant of sedimentation and lowered salinity than are corals from other families of corals (Brown and Holley, 1984). Tolerance to sedimentation and low salinity results in *Porites spp* being more successful than other species in the colonization of the reefs in the Sichang Islands. A comparable situation was reported by Kleypas (1996) on coral development under naturally turbid conditions on the fringing reefs near Broad Sound, Australia. He showed that the shift in species dominance with proximity to a high sedimentation region reflects both a shift to more turbidity tolerant species and the elimination of major framework builders such as *Acropora spp*. Moreover, Babcock and Davies (1991) found that survival rate in post-settlement of *A. millepora* can be reduced significantly by relatively small increases sedimentation rates.

Where natural stresses such as sedimentation and eutrophication are relatively low and salinity and light illumination are close to open ocean water conditions but where there are frequent disturbances such as wind-generated waves and strong water currents, *Acropora spp.* are the most successful species. The Group 3 reefs in this study are characteristic. Veron (1986) claims that *Acropora* corals favor and can successfully survive in reef habitats exposed to wind-generated wave and strong current. Sorokin

(1995) described *Acropora* corals as opportunistic species: those which grow as small- or medium-sized colonies; have a determined growth; reach early sexual maturity. Most of them have a life of short duration and a high growth rate. This would suggest that the success of *Acropora* is achieved by their intensive propagation by either sexual breeding or asexual fragmentation. Such recruitment increases their chances in competition for hard substrate (Veron 1986).

The dominant species of Group 2 reefs may be a result of either or both human-induced and stochastic, natural events. Nutrients from waste waters and organic-contaminated water may be a significant factor in creating better conditions for zoantharian growth and thus, increasing competition for hard substrate between zoantharians and corals (Loya, 1975). As an example of human-induced impacts, the construction of deep-sea port and the spillage of agricultural products from open loading platforms could have had effects on the coral reef at Sichang Station 2. The effects of occasional freshwater run-off are an example of stochastic natural events that may favor zoantharians. Observations on coral reefs after large-scale freshwater flooding in Kaneohe Bay, Hawaii by Jokiel et al. (1993) revealed that zoantharians tolerate lower salinity better than most species of reef corals. Sharp fluctuations of salinity caused by seasonal freshwater run-off are thought to have possibly had an effect in shifting the dominant species on the reef at Sichang station 4.

PART B: TEMPORAL VARIATION

Overall Temporal Variation of Reef Components

Data sets on sea surface temperature, salinity and dissolved oxygen (Appendix 4) received from satellite buoys (SEAWATCH Project, The National Research Council of Thailand) positioned close to the study locations reveal that no extraordinary temperature- or salinity-related events were detected during the 1996 to 1998 period. The graphical reports of physical parameters can be summarized as follows: Around the Sichang Islands and in the Vicinity of Pattaya, salinity fluctuated within the range of 26 to 32 ‰. In the Sattahip Region, salinity was 31 to 33 ‰. The whole-year average of sea surface temperature was not different in either area and ranged between 29 and 31 C°. The level of dissolved oxygen recorded at the surface ranged from 70 to 120% around the Sichang Islands and in the Vicinity of Pattaya and from 80 to 100% around the Sattahip Region. Dissolved oxygen cannot exceed 100% so the readings above 100% are spurious.

In general, corals and associated reef fauna flourish under relatively narrow range of environmental conditions where salinity ranges between 27 and 48 ‰ and temperature between 15 and 29°C (Stoddard, 1969). Stoddard (1969) also wrote that the boundaries of water temperature that produce the mortality in many reef-building corals are below 5°C and above 36°C. The effects of extremely low salinity associated with freshwater flooding on coral mortality were studied by Jokiel (1993) who found lower lethal salinity ranges between 15 and 20 ‰. Veron (1986) stated that only in rare cases does the sea water salinity become naturally high enough to have widespread effect on corals.

Table 21. A Summary of overall time-dependent changes in percent cover of reef components determined by Repeated Measures ANOVA (using SPSS version 7.5) on the all-matched and the 1997-98 matched stations.

Reef components	Overall time-dependent change	
	All-matched stations (three-year period)	97-98 matched stations (one-year period)
Total living corals (living coral components combination)	NS	SI
Acropora	NS	SI
Porites	NS	SI
Faviid coral	SD	NS
Other living coral	NS	NS
Other sessile organism	NS	NS
Dead coral	NS	SI
Abiotic	NS	NS
Dead coral/abiotic combination	NS	NS

NS , no significant change
SI , significant increase
SD , significant decrease

Results from statistical testing using "Repeated Measures ANOVA" to determine time-dependent change on each reef component on either all-matched or 1997-98 matched stations are summarized in Table 21. It shows that time-related changes in reef components on the all-matched stations are quite different from those on the 1997-98 matched stations but then, the temporal and spatial scales are different. However, with the exception of a reduction in faviid coral cover, the two data sets come to agreement in that no overall negative changes in any of the other components were detected on either data set. Because the reduction in cover on the all-matched stations was in those which were relatively less abundant (Faviids), the reduction did not have a strong impact total change in percent cover. Harriott et al. (1994) suggest that some minority species can temporarily recruit to and survive on reefs but fail to establish self-maintaining populations because of the very small number of colonies in the population. The population of that particular species may then disappear from the community until new recruits arrives from other seeding grounds via larval dispersal. The other components on all-matched stations maintained their relative abundances over three years.

Area coverage of two major dominant components (*Acropora* and *Porites* components) on 1997-98 matched stations increased and resulted a noticeable increase in total living coral cover while the faviid coral, other living coral and other sessile organism components showed no significant time-related changes. Over the broad scale, where stresses caused by natural, environmental conditions are relatively low, changes in terms of area cover of certain groups of corals seem to be determined by characteristics such as toleration of high sedimentation, low salinity and eutrophication and interspecific competition between one coral and another. A noticeable decline in area cover of faviid corals may partially indicate such shifts in community structure. Some massive forms of faviid corals as well as *Porites spp.* are normally found in harsh environmental conditions with high turbidity and relatively low salinity (Dustan and Halas, 1987). These are then classified as "stressor corals" or classical *K*-strategists according to their tolerance of those conditions (Edinger and Risk, 1998). Such harsh conditions normally occur around the reefs in the Sichang Islands and around certain reefs in the Pattaya and Sattahip regions. Environmental conditions throughout the study period in this region (NRCT, 1998) have been favorable for the growth of other corals which, in turn, outcompete faviid and *Porites* corals by overshading or overgrowth. The reduction of faviid corals due to shading and overgrowth should have occurred preferentialy on *Acropora*-

dominated reefs, however the statistical results showed no significant time-related differences between reef types (Table 9 and Figure 12c). Another reason for the faviid reduction is that on two of the four non-*Acropora* reefs used in the all-matched comparison, small colonies of faviid corals occurred on dead coral close to the sand-bottom and on small rock rubble that consisted of small rocks. Some of the small rocks were displaced during the study and some of faviid colonies were buried in sand.

In the 1997-98 matched station comparison, the *Porites* component exhibits an overall time-dependent increase in area cover over three years but a decrease in the *Porites* component was detected specifically in *Acropora*-dominated reefs (Table 8 and Figure 11d). A similar pattern was noted by Done and Potts (1992) who found that ubiquitous, fast-growing corals, *Acropora hyacinthus*, *A. formosa* and *A. grandis,* for example, grow approximately ten times faster than *Porites spp*. and form a closed canopy (up to 50 cm high) over massive corals. Small *Porites* colonies can survive some shading from overtopping but complete closure of a dense canopy of coral branches can cause death.

In 1997-98 matched station comparisons, the *Acropora* component shows an overall increase as does the *Porites* component (Table 21). *Acropora* corals are capable of increasing their area cover and colony numbers by means of planulation (sexual propagation) and fragmentation (asexual propagation) (Veron, 1986). Their success in reef domination is restricted to certain islands in the Pattaya and Sattahip regions possibly because no low salinity and seasonal freshwater run-off events affect reefs in those areas. *Acropora* are intolerant of low salinity. A lack of abnormal, stochastic salinity- and temperature-related events during the three-year study period (NRCT, 1998) has allowed *Acropora* to increase. This did not result in a statistically significant increase in *Acropora* in the three-year, all-matched station comparison (Table 5 and Figure 10a) because there was large decrease of *Acropora* on Sattahip station 11 caused by physical, human-impact (possibly a boat grounding) between 1995 and 1997. Despite the considerable damage to the coral on station 11, a large increase in *Acropora* component cover occurred on the same reef between 1997 and 1998. The reef proved resilient to physical damage over short period of time due to rapid growth and structural simplicity (Shinn, 1972). A similar pattern of *Acropora* recovery was observed in a study on the recolonization of a coral reef damaged by a storm on Phuket Island (Phongsuwan, 1991). He found that two years after storm damage, *Acropora, Pocillopora, Montipora, Porites* and *Favites* were the first major genera to recover. Additionally, five years after storm damage *A. formosa* and *A. hyacinthus* were the only species successful in the upper reef area.

Porites spp. are known to be tolerant of low salinity and as a result become a major or dominant component on most reefs in the Gulf of Thailand (Sakai et al., 1986). Despite some minor *Porites* component reduction due to the effects of overshading and overgrowth by fast growing corals, in the 1997-98 matched station comparison, a significant, overall increase was detected (Table 8 and Figure 11b). Generally, linear growth of massive *Porites spp.* has been measured at 1 to 2 cm per year (Schneider and Smith, 1982; Scoffin et al., 1992), relatively slow compared to growth in branching corals (Charuchinada and Hylleberg, 1984). The growth of existing *Porites* colonies may not be a major contributor to their measured increase. In many stations in the Sichang

Islands, small, newly-formed colonies produce additional *Porites* coverage. This is almost certainly attributable to high larval settlement during the absence of environmental stresses. Done and Potts (1992) suggest that the combination of life-history traits common to massive *Porites spp.* of high larval recruitment, a propensity to fragment and the propensity of fragments and entire colonies to survive transportation and become established as independent colonies may be responsible for their increase.

Most of the reef corals falling into the other living coral component are categorized as competitive species (Edinger and Risk, 1998) which rarely occur in frequently disturbed habitats. *Montipora spp., Turbinaria spp, Pavona spp. Goniopora spp. Aveopora spp.* and *Fungia spp.* are examples. Generally, the persistence of the other living coral component in data sets (Table 21) points to the absence of extraordinary, salinity- and temperature- related stochastic events during the investigation period.

Zoantharians are principal members of the other sessile organism component. They can be used as indicators of the impact of freshwater discharge (Jokiel et al., 1993) and eutrophication associated with both natural events and human activities. Reef corals can successfully survive a certain degree of nutrient concentration in water surrounding the reef however, excessive nutrient concentrations can trigger the growth of zoantharians and macroalgae which, in turn, outcompete reef corals. In stations 2, 13 and 14 the accumulation of nutrients caused direct by human activities is considered to be a serious problem that has resulted in reef degradation. Though the reefs show a reduction in the zoatharians over time, no significance in overall time-related change of this component was statistically detected (Table 21). This would imply that there has been no further accretion of nutrients sufficient to promote the expansion of zoantharian organisms. It may not be very reliable to use zoantharian cover as an indicator of eutrophication and sewage discharge. According to Suchanek (1981), the expansion and contraction of area covered by zoantharians depends upon season, predation by other organisms and burial by substrate movement induced by wave action and water currents.

The increase in cover of dead coral component (Table 21) is probably not an indication of actual coral mortality. During the field investigations, a fluctuation in area cover of the dead coral and the abiotic components was observed in many stations (i.e., stations 3, 4, 5, 6, 8, 13 and 14). The fluctuations were greatest where coral assemblages formed relatively low-density, patchy reefs and where soft and moveable substrates such as sand, silt, small rubble, seashell, fragments of dead coral and coral debris cover a large area. In three of those stations (stations 4, 6 and 8) reefs are developed on the windward side of the islands. The coincident increase in dead coral cover may be due to the perturbation caused by monsoonal wind-generated waves and water current. This conclusion is supported by the study of Witman (1992) that showed that the perturbation caused by wind-generated waves determines the fluctuation and the size-difference of patches of free substrates on protected and exposed reefs in St. John, U.S. Virgin Islands.

The overall increase in area cover of total living corals, of *Porites* and *Acropora* components and the maintenance of cover by the other living coral component and by the other sessile organism components in the 1997-98 matched stations comparison (Table 21) indicate that the coral reefs have experienced relatively "stress-free" environmental conditions. Furthermore, there were no signs of extensive, physical damage by wind/wave action or human activities except in station 11. All findings in this study indicate reef stability and population maintenance of the dominant species (Connell, 1978; Brown and Howard 1985). Coral reefs observed today are shaped and maintained by biotic and abiotic events of exceptional magnitude that occur infrequently (Witman, 1992). However, to determine the cause of change in reef community structure it is necessary to carry out the studies over a time scale long enough to document at least one of these exceptional events. Such exceptional events, for instance, major hurricanes (Stoddart, 1974), tropical storms (Phongsuwan, 1991; Warwick and Clarke, 1993), predation (Endean, 1976; Maguire and Porter, 1977), urban impact (Connell, 1997) and anchor damage (Sudara, 1994) can result in negative change to a coral reef community structure which subsequently alters the entire community structure (Richmond, 1993).

Within Reef Variation

Individual coral reefs have a distinctive biological structure shaped by different natural and man-made environmental parameters (Done, 1982). Because the combinations and permutations of the parameters that shape reefs are enormously variable, almost every reef is unique. The fourteen stations chosen for examination in the eastern seaboard of the Gulf of Thailand were selected to represent a wide range of environmental parameters. At the same time, coral reefs have an ordered biological structure that is characteristic over large geological areas (Rogers, 1993; Veron, 1995; Done, 1982; Jackson, 1992; Karlson and Hurd, 1993). Features of importance to or on individual reefs are often submerged in the overall ordered structural pattern derived from examination of all or large subsets of the reef sites together. Pattern of change over time for an individual reef may be unique and may not follow the statistical trend for the larger set of reefs. Detailed examination of individual reefs can often uncover features, characteristics, peculiarities or processes important in understanding the interaction of the reef system with its environmental parameters. One salient feature of each reef study site is briefly discussed in the following account.

Porites-dominated reefs

Sichang Station 1 (Tai Tamun Island)

In general, reef condition and area coverage of coral components were relatively unchanged through three years probably because the environmental conditions have been relatively constant during this study. Some degree of coral coverage reduction appears to have been caused by interspecific competition between reef corals and zoantharians. In 1998, some areas were now infested with *Palythoa* and zoanthids where there had been previously living tissue of *Porites spp*. Patterns of margin interaction between *Palythoa* and *Porites spp*. similar to those described by Suchanek (1981) were found on these reefs and included what he designated as lateral aggression, overtopping and point settlement. Lateral aggression seemed to be common here. Suchanek (1981) detailed lateral aggression as that in which there was no direct physical contact with living *Porites* tissue. There is a margin of dead tissue in front of the advancing *Palythoa* colony and it is assumed that some form of allelochemical interaction is occurring. This suggests that even though *Porites spp*. in this area are thought to be tolerant of low salinity and turbid water, these may somehow have weakened *Porites spp.* rendering them vulnerable to diseases and to infestation by surface-dwelling zoanthids and *Palythoa sp.* and by bioeroders such as *Lithophaga sp.* and boring polychaetes (Peters, 1996).

Sichang Station 2 (East-Sichang Island)

Deep-sea port construction has been ongoing since 1994 near this site and was expected to have some direct impact on this coral community. The coral reef monitoring program was initiated in 1995 so the status of this reef before commencement of construction was unknown. During the three-year study period, some coral components showed changes in percent area coverage. Percent cover of *Acropora spp.* increased over time from an initial coverage of 0.9% to 6.8% in 1998. Percent cover of *Porites spp.* decreased in 1997 and increased in the final year. The decrease in *Porites* coverage in 1997 may possibly have been due to the effect of suspended particulate matter on the reef. An increase in sediment load is thought to have been caused by "sea dumping" of large rocks during the foundation-laying phase of port construction. In 1998, many small colonies of massive form *Porites* colonies were noted and were responsible for the noted increase in area coverage of *Porites spp.* The majority of sessile organisms were the zoanthids, *Palythoa sp.* Indicators of a reef under degradation by sedimentation and eutrophication (D'Elia and Wiebe, 1990), zoanthids and *Palythoa* gradually decreased over time. However, the expansion and contraction of zoanthids and *Palythoa* populations also depends on grazing pressure and seasonal variation (Suchanek, 1981).

Overall, the relative increase of coral components and the decrease of other sessile organisms indicate improved conditions subsequent to completion of port construction.

Sichang Station 3 (West-Sichang Island)

On this location, coral colonies are sparsely scattered on a primary rock platform. Over the last three years, area coverage of *Porites spp*. and other living coral components has progressively increased. The increment of *Porites* coverage was probably due to its ability to tolerate the naturally turbid and low salinity water that usually occurs around the Sichang Islands (NRCT, 1998). This is also supported directly by the increase of the other living coral component that includes species such as *Symphyllia spp. Galaxea fascicularis* and *Goniopora djiboutiensis* described by Veron (1986) as sediment-tolerant species. The disappearance of the single, one-meter *Acropora spp.* colony on the line transects was probably caused by physical destruction; possibly from an anchor dragged by fishing or tourist boats which often moor around this area. Sudara and Yeemin (1994) maintain that further down the eastern part of inner Gulf, coral reefs on the islands of the eastern part of the Gulf of Thailand including the Sichang Islands group and the Pattaya Islands group have been damaged from over-use particularly by tourism and fishing. The damage includes direct physical destruction by coral collecting for souvenirs, incidental damage by careless divers, anchoring on coral reefs and illegal fishing activities on the reefs.

Sichang Station 4 (Sampanju Island)

The 1995 transects were not matched to those of 1997 and 1998. This revealed the heterogeneous nature of coral distribution within this site. On the 1995 transect, *Porites spp.* and faviid corals appeared to co-dominate the reef with area coverage of 8.3% and 10.1%, respectively. In 1997 and 1998 transects, *Porites spp.* were dominant species with an area coverage of 43.8% and 65.8% respectively. In a comparison between the 1997 and 1998 transects, area coverage of the dominant species, *Porites spp.* dramatically increased. In 1998, it was observed that most coral colonies were unattached and fallen. The reef is located near a small island exposed to both northeast and southwest monsoonal winds. The decrease in coral coverage and great fluctuation of small, movable substrate (coral rubble and sand) may have been caused by intense wave action generated by monsoonal winds. In 1998, young and small *Porites* colonies of a size between 10 and 20 cm were found colonizing dead coral and rock substrates. This would suggest that *Porites* might have successfully recovered on this reef after intense disturbance due to high environmental stress such as intense monsoonal wind generated waves, low salinity and turbid water. Interestingly, some newly settled *Porites spp.* colonies were observed in 1998 to produce encrustations on existing calcareous skeleton and primary rock outcrops rather than new, hemispherical, growth forms. This would maximize area coverage by *Porites* where hard substrate is available and environmental conditions are suitable. This observation perhaps indicates the need for a redefinition of life strategy of *Porites* corals.

Sichang Station 5 (Lan Dokmai Island)

The reef on this island is dominated by *Porites spp.* with coverage of approximately 50% of the reef area and substantial increase of *Porites spp.* was observed over time. While faviid coral coverage remained relatively constant in the first two-year period, it decreased significantly between 1997 and 1998. Corals such as *Goniastrea, Favia, Favites, Goniopora djiboutiensis* and *Symphylia sp.* were noted as being attached on rock and coral rubble. This suggests that the noted fluctuation in coverage of these species could have been associated with the movement of the relatively small hard substrate components (rock and coral rubble) and of sand by water current and wave action. In the laboratory, scleractinian and alcyonacean corals manipulated under conditions where there was high sedimentation and little water motion were only able to withstand short-term, episodic burial sand. Continuous sand deposition resulted in stress responses from partial bleaching through death (Riegl, 1995).

Pattaya Station 6 (Nok Island)

The coral community can be best described as *Porites*-dominated. *Porites* has been noted to be minimally aggressive in terms of interspecific competition (Lang, 1973) but has established itself as the dominant species in this area. Chou et al. (1990) stated that as with the reefs in the Sichang Islands, the development and community structure of coral reefs around Nok island is attributable to the seasonal effect of freshwater run-off from the uppermost of the Gulf of Thailand.

During the 1997 to 1998 period, the area coverage of fast-growing corals such as *Acropora*, (mostly the tabulate form of *A. millepora, A. valida*) and *Montipora spp.* increased while area coverage of the slow-growing, massive forms of *Porites* and Faviids decreased. The reduction of area coverage of massive corals appears to be the result of overshading by fast-growing corals.

Pattaya Station 7 (Krok Island)

The reef on this island is characterized as a platform of massive *Porites spp.* colonies. Occasional exposure to air during extreme low tides has resulted in the formation of *Porites* micro-atolls (Sakai, 1986). Tabulate forms of *Acropora millepora, A. humilis, Montipora sp.* and *M. informis* colonize the dead central portions of *Porites* microatolls while other corals such as *Favia, Favites, Platygyra daedalea, Pavona decussata* and *P. lata* occupy the space between *Porites* colonies.

During the three-year monitoring period, decrease of area coverage was found only in *Porites*. On such a coral platform, vertical growth is limited by sea level during low tide and lateral growth of corals is limited by interspecific competition. Perhaps the reduction in *Porites* coverage is due to the combination of heat, radiation exposure, increase of overshading and overshadowing by tabulate corals and interspecific aggression between *Porites* and neighboring coral colonies. According to Lang (1973) the Poritidae and its member *Porites* are minimally aggressive while the families Mussidae, Meandrinidae and Faviidae are near the top of the aggressive hierarchy. Direct human impact, which has been a major cause of coral destruction in the Pattaya Region evidently did not affect this reef. There are two reasons for this. Firstly, the reef forms the edge of a private island and is not publicly accessible to tourists. Secondly, this shallow reef dominated by large colonies of brownish, massive corals and with few branching corals is not attractive to either divers or illegal coral collectors.

Pattaya Station 9 (Jun Island)

From 1997 to 1998, the area coverage of both the *Porites* and the faviid coral component decreased while the other living coral component increased slightly. Only the area coverage of *Acropora spp.* increased rapidly. Colonies of *Porites* were seen partly or, in some cases, entirely overgrown by neighboring branching or tabulate forms of *Acropora*. This may not result in immediate mortality for *Acropora*'s competitors but photosynthetic deficiency of symbiotic zooxanthellae will eventually cause those corals to perish (Lang, 1973 and Veron, 1986). This pattern of interspecific competition over space was also apparent on station 7 (Krok Island).

Pattaya Station 10 (Sak Island)

Overall, coverage of reef components on 1995 and 1998 transects appeared to be similar with minor changes of coverage in *Acropora spp., Porites spp.* and faviid corals. The exception was a rapid increase of the other living coral component mainly as a result of an expansion of tabulate *Montipora spongodes* which colonized the primary rock substrate. *M. spongodes* is quite abundant on this location. Coral species diversity on this island is relatively less than on other reefs in the Vicinity of Pattaya and the availability of hard substrate is relatively high. Because of the availability of substrate, interspecific competition is low and has allowed a fast-growing species, in this case *M. spongodes*, to increase their area coverage faster than other corals.

Sattahip Station 13 (Samaesan Island)

That the reef is characterized by dead coral and coral debris of branching *Acropora* suggests that it was once dominated by *Acropora* corals and was similar to many of the present reefs in Sattahip. The dominant species now found are *Porites spp*. and *Goniastrea spp*. Over the past two decades the island has been used for military training by naval troops. This severely damaged the coral reefs. As well, damage from coral collecting for souvenirs has been extensive despite laws that had been established for protection of corals (Soncheang, 1998; pers. comm.). Sirirattanachai et al. (1987 a, b) also claim that degradation and the low recovery rate of coral reefs on Samaesan and nearby islands has been caused by impact related to sewage discharge from Sattahip town and the closer, local village.

The area coverage of *Acropora spp*., *Porites spp*. and other living corals increased over the study period. Many new, small colonies of *Acropora* and massive *Porites* with the average size of 10 to 15 cm were found on dead corals and coral debris. On the other hand, colonies of faviid corals (mainly small colonies of *Goniastrea spp*.) decreased. During the field investigation, it was observed that there was a noticeable movement of sand and coral debris probably due to seasonal, wind-generated waves. This has resulted in great fluctuations in recorded dead coral and abiotic components. It also suggests that seasonal, passive movement of reef substrate may have an effect on coral coverage particularly in terms of colonization by new coral colonies.

Sattahip Station 14 (Raet Island)

On this island, physical damage to the coral reef by repeated dynamite fishing has been found (Soncheang, 1998; pers. comm.). This coral community was also once dominated by branching forms of *Acropora* judging from the large amount of *Acropora* coral rubble but now, massive *Porites spp*. are dominant. A similar pattern of physical damage from dynamite fishing was also found on another Raet Island in Chumporn on the west coast of the Gulf of Thailand. Dynamite blasting destroyed the original dominant foliose corals (*Pavona decussata*) leaving only *P. lutea* (Sudara, Thamrongnawasawat and Sookchanuluk, 1991). Between 1997 and 1998, a gradual decrease in coral coverage occurred in almost every coral component except in that of the faviid corals in which a small increase was detected. Slow coral growth and low recruitment could partially be results of the constant impacts related to sewage discharge which reduces coverage of many corals and inhibits new colonization by corals. As mentioned by Sirirattanachai et al. (1987), reef condition and coral recruitment on Raet Island is determined by sewage discharge from a local village and the much larger city located upstream in Sattahip Bay. The discharge is carried by a local water current running eastward along the coastline of the Sattahip Region. The contaminated water accumulates around Samaesan and Raet Islands before it empties into Rayong Bay.

Acropora-dominated reefs

Pattaya Station 8 (Lan Island)

Coral reefs around Lan Island have been the most heavily visited by tourists and have served as sites for snorkeling and SCUBA diving. This is probably due to proximity to Pattaya city and its hotels and resorts (Wells, 1988). Consequently, tourist activities have caused both direct and indirect destruction on most of the reefs around this island and on other reefs in the Pattaya area. The increase in area coverage of *Acropora* and lack of evidence of physical damage on this reef during the 1997-8 study period indicates no major disturbance by tourist activity. Normally, *Acropora* and other branching corals are quite vulnerable to physical damage by light contact from careless divers or heavily crashing anchors.

The coral reef studied on Lan Island is developed on the windward side of the island which is directly exposed to the southwest monsoon and is characterized by patches of various species of *Acropora* on a sand bottom. Both tabulate and arborescent forms are present. Substrate consists mainly of sand and coral debris and coral rubble. Most of the small forms of massive corals and the solitary corals are established on coral debris. A noticeable increase in *Acropora* coverage and a decrease in *Porites* coverage occurred during 1997 to 1998. Veron (1986) suggested that colony breakage by wave action is one of the propagation modes for many species of *Acropora* and broken pieces of *Acropora* can be carried over relatively great distances. This is the explanation for reef formation on this site according to Sakai et al. (1986) who maintain that mono-specific and unattached stands of *Acropora* on sand bottom are formed by fragmentation. Loya

(1972) claims that branching corals have an advantage over massive corals in such locations because shifting sand would bury and/or scour massive corals. Branching forms are more likely to escape burial and scouring because they are taller.

Sattahip Station 11 (Kham Island)

The reef studied on the northwestern side of Kham Island is characterized by a monospecific stand of *Acropora formosa*. Between 1995 and 1997, a massive mortality of *A. formosa* occurred. Because this island is designated as Marine Park and is supposedly well-protected by the Royal Thai Navy, intensive, human-induced impact should not have been responsible for the mortality of this species. In shallow-water reefs, acroporid corals are capable of rapid increases in area cover (Veron, 1986). In this acroporid reef the decrease in area cover of the *Acropora* component is in striking contrast to that statement. This kind of decrease among the branching coral community is normally associated with storms or heavy wave action generated by monsoonal winds (Porter and Meier, 1992) but during the investigation, no report of typhoons or heavy monsoons occurred in this area. The videograph taken in 1997, revealed the presence of dead branches of *Acropora* corals that were collapsed and covered by zoantharians however, there was no evidence that zoantharians killed the corals but rather it could be assumed that bared substrate was actively colonized by zoantharians. The videograph also revealed living *Acropora* corals that persisted through 1998 unbroken including some large, highly branched colonies. These observations suggest that storm damage was not the cause of coral coverage reduction between 1995 and 1998 but rather human activity possibly an anchor or the grounding of a ship. As a consequence of the dieoff of *A. formosa*, the area previously occupied by this species was taken over by numerous solitary corals: *Fungia fungites, F. scutaria* and *F. echinata*. In the 1998 re-examination, *Acropora* showed signs of recovery with an increasing area coverage but coverage was still lower than the initial coverage in 1995.

Sattahip Station 12 (Yoh Island)

The coral reef on this island is dominated by various species of *Acropora,* namely, tabulate forms of *A. spicifera, A. hyacinthus* and branching forms of *A. formosa* and *A. grandis*. During the 1995 to 1997 period, area coverage of all reef components remained unchanged. In the 1998 re-examination, percent cover of *Acropora* has increased rapidly with approximately 10% additional coverage while the area cover of all massive colonies (*Porites spp*. and Faviid corals) was reduced. This suggests that the massive corals were being overgrown by relatively faster-growing *Acropora*. However, overgrowth might not cause widespread, sudden, lethal effects in those massive corals. This finding would appear to agree with models of reef development (Loya,1976, Maguire and Porter, 1977 and Connell, 1978) that predict a loss of less-abundant species as community structure is increasingly dominated by branching corals (most of those in the Genus *Acropora*) that overtop and shade out competing understory species.

PART C: CONSERVATION

The English plant ecologist J.P. Grime (1994) suggested that stress forms another dimension to which adaptation of life history is important. Stress consists of external factors that limit productivity; factors such as low temperature, aridity, low mineral nutrient level, and for understory plants, heavy shade. In this view, habitats that are cold, dry, otherwise deficient tend to select for stress tolerators; plants that grow slowly, live a long time and reproduce only when they can afford to. Habitats that suffer frequent disturbance select for ruderals. These are the classical, *r*-selected, fast-growing, heavily-reproducing annuals. Habitats that are neither stressful nor frequently disturbed are occupied by competitors; large-sized, relatively long-lived plants that occupy a lot of space both above and below ground. These are *K*-selected species in the *r-K* classification but clearly, so also are the stress tolerators. Habitats that are intermediate as to disturbance or stress would select for intermediate life histories.

Although developed for plants, the classification can also be applied with some justification to reef corals. Edinger and Risk (1998) used a ternary diagram based on the classification of coral life histories for assessing the conservation value of natural habitat. This is important to conservation policy particularly for tropical biodiversity conservation where national parks frequently include zones with various levels of protection while sustainable resource exploitation by local inhabitants continues in some zones. The conservation value (CV) of a coral reef is related to the biodiversity of corals, invertebrates and fishes and to its fisheries potential as well as its habitat for rare or endangered species. Estimates of coral reef conservation value can be used in choosing which areas or reefs are most deserving of protection and in zoning existing marine protection areas. The most protection-deserving reefs are rated from high to low corresponding to their assigned conservation values. According to Edinger and Risk (1998) the position of reefs on the ternary diagram reflects their conservation values (Figure 57).

Reefs dominated by stress-tolerators which are mostly massive corals have relatively the lowest coral species richness and least morphological diversity and hence are assigned the lowest conservation value (CV=1). They deserve the least effort in restoration as they will yield the lowest ratio of incremental increase in biodiversity conservation or fisheries enhancement per unit remediation effort. The suggestion would be to abandon such severely degraded reefs and focus on those in better health, for which remediation and protection efforts are more likely to succeed (Edinger and Risk, 1998).

Reefs dominated by foliose corals and branching non-*Acropora* are assigned a conservation value of 2 (CV=2). Reefs assigned a conservation value of 2 are uniform habitats with low coral cover and low fish diversity.

Reefs dominated by *Acropora* corals are assigned a conservation value of 3 (CV=3) because *Acropora* corals are major contributors to coral species diversity throughout Indo-Pacific (Veron, 1986). These reefs often have greater topographic complexity than reefs dominated by foliose corals or branching non-*Acropora* corals and yield relatively high fisheries potential.

Finally, reefs falling in the center of the diagram where all three morphological groups are represented in approximately equal proportions, are assigned a conservation value of 4 (CV=4). These reefs are likely to provide optimum fish habitat and maximum fisheries potential, therefore protection of CV=4 reefs should be of great concern.

Reefs in the study area were categorized by plotting percent area coverage of ruderal, competitive and stress-tolerant species on a ternary diagram. All reefs in the Sichang Islands, reefs in stations 6 and 7 in Vicinity of Pattaya and reefs in stations 13 and 14 in Sattahip Region obtained a conservation value of 1. This is due to the dominance of the stress-tolerator, *Porites spp*. on all of those reefs. All of coral reefs occurring in Sichang Island and two reefs in Sattahip Region have developed under the influence of land-based stressors such as high turbidity freshwater discharge, siltation and eutrophication. Stations 8 and 9 in Vicinity of Pattaya and stations 12 and 13 in Sattahip Region obtained a conservation value of 3 as a result of being dominated by ruderal species of *Acropora* corals. These CV=3 reefs occur in sheltered areas or on deeper reefs with strong water movement. These occasionally are affected by physical damage from wave action during monsoon seasons. Only the reef on station 10 in Vicinity of Pattaya obtained a conservation value of 4 due to the morphological complexity of its corals in which *r*-strategists, K-strategists and stress-tolerators occur with equal proportions.

No reefs in this study area fall into CV=2 reef category because no reef habitats exist in the study area where the degree of intensity of both natural disturbance and anthropogenic stress is low enough to allow competition between corals to occur for a long enough time period to take it to a climax condition. None of the reefs in this study was found relatively undisturbed and stress-free. In undisturbed reef habitats, the success of competition between corals is naturally determined by the advantageous characteristics of one coral species over other species (Grime, 1994). Those species are referred to as competitive species (K-strategists).

The result of reef classification using cluster analysis based on percent coverage of reef components is quite similar to the R-C-S ternary diagram classification (Figure 57) which is intended for conservation value assignment and coral reef management. However, it seems that, from a practical perspective, the application of a conservation value based on the R-C-S ternary diagram is less complicated and more suitable for volunteers, reef managers and researchers. Determination of conservation values does not require a background in coral taxonomy and statistics.

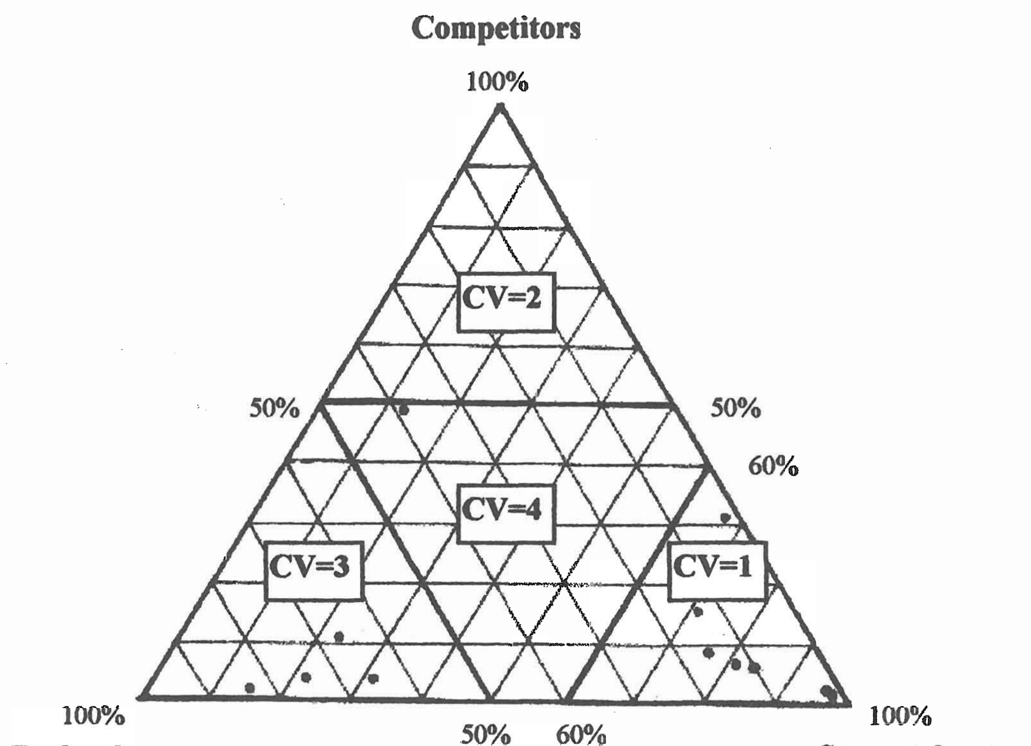

Figure 57. R-C-S ternary diagram for coral reef conservation values (Edinger and Risk, 1998 after Grime, 1994). All study reefs were plotted on the diagram based on percent area cover of Ruderals (r-strategists), Competitors and Stress tolerators (n=14). Note: Conservation Value (CV)=1 was assigned to nearshore polluted reef sites dominated by massive and submassive corals. CV=2 was assigned to late successional reefs dominated by monospecific stands of foliose and branching non-*Acropora* corals. CV=3 was assigned to reefs dominated by *Acropora* corals. And CV=4 was assigned to reefs with approximately equal mixes of these three end- members.

CONCLUSIONS

1. Over the three-year monitoring period, no negative changes in total area cover of living corals on fourteen study locations were statistically detected. This suggests that over the three years of the study the environmental conditions did not change substantially and the increase in human population around the eastern seaboard during that time did not have measurable effects on these reefs.
2. In the comparisons between 1997-98 matched stations, increases of living coverage were detected in the Acropora and Porites components. This leads to the conclusion that overall, the environmental conditions were favorable and had promoted coral growth for at least the last two years of the study.
3. The outcompetition of massive corals (*Porites* and faviid corals) by faster growing corals (*Acropora* and *Montipora*) in some areas, was indicative of favorable environmental conditions.
4. Overall, no significant change was detected in coverage by the other sessile organism component, which is primarily zoantharians. Yet, a reduction in area coverage by zoantharians occurred in those areas which had been heavily affected by human activities. These findings also point toward improving environmental conditions over the study period because zoantharians are indicators of eutrophic conditions.
5. On some stations, movement of substrate by wave action and water current was responsible for fluctuations in coral coverage.

6. Strikingly rapid increment in *Porites* coverage via planulation and growth over primary rock substrate and dead coral skeleton was observed and was a major contributor to increases in these corals on some reefs. Such two-dimensional rather than three-dimensional skeletal acquisition in *Porites* may lead to a redefinition of the life strategy of massive *Porites* corals.
7. Domination by *Porites* corals and low coral species diversity on reefs in the Eastern Seaboard of the Gulf of Thailand are results from naturally turbid water and low salinity caused largely by high-sediment, freshwater run-off from four major river outlets located in the uppermost area of the gulf.
8. The number of species of acroporid corals (Family Acroporidae) shows a positive correlation with distance from the four major river outlets.
9. Cluster analysis based on percent area coverage of seven major reef components results in three distinctive coral community types: 1) reefs dominated by *Porites*, 2) reefs dominated by *Acropora* and 3) reefs dominated by zoantharians. These community types are the reflection of adaptability of corals and other reef organisms in response to both natural and man-made effects. This classification of reef communities is similar to the Conservation Values classification (Edinger and Risk, 1998) that is for use in coral-reef management.
10. Physical damage to coral reefs caused by human activity was noted. This suggests that current methods of reef protection cannot prevent some significant coral mortality. Intentional and unintentional human impact may be factors in coral decline.

Boat grounding, coral collecting for souvenirs, anchor damage, diver damage, dynamite fishing and military exercise are possible sources of coral mortality.

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A P P E N D I X 1. Raw data of percent area cover of reef components over the three-year study period (1995, 1997 and 1998)

1995 Sampling

1995 Sampling
Sichang station 1
Tai Tamun Island

I	intervals		(cm)	% cover
Porites	0	130	130	6.5
Sand	130	200	70	3.5
Pocillopora	295	300	5	0.25
Porites	300	410	110	5.5
Dead Coral	410	420	10	0.5
Montipora	420	435	15	0.75
Porites	435	507	72	3.6
Favites	507	530	23	1.15
Porites	530	550	20	1
Dead Coral	550	568	18	0.9
Favia sp	568	590	22	1.1
Porites	590	638	48	2.4
Favites sp	638	640	2	0.1
Dead Coral	640	670	30	1.5
Porites	670	692	22	1.1
Dead Coral	692	725	33	1.65
Porites	725	755	30	1.5
Dead Coral	755	820	65	3.25
Montipora	820	850	30	1.5
Dead Coral	850	870	20	1
Porites	870	920	50	2.5
Dead Coral	920	970	50	2.5
Porites	970	1020	50	2.5
Dead Coral	1020	1070	50	2.5
Pocillopora	1070	1210	140	7
Dead Coral	1210	1220	10	0.5
Pavona	1220	1230	10	0.5
Porites	1230	1270	40	2
Dead Coral	1270	1375	105	5.25
Porites	1375	1490	115	5.75
Dead Coral	1490	1510	20	1
Porites	1510	1745	235	11.75
Dead Coral	1745	1760	15	0.75
Porites	1760	2000	240	12
Totals			2000	100

II	intervals		(cm)	% cover
Porites	0	20	20	1
Dead Coral	20	117	97	4.85
Porites	117	170	53	2.65
Dead Coral	170	230	60	3
Porites	230	325	95	4.75
Dead Coral	325	350	25	1.25
Montipora	350	370	20	1
Dead Coral	370	405	35	1.75
Porites	405	490	85	4.25
Dead Coral	490	570	80	4
Porites	570	605	35	1.75
Dead Coral	605	640	35	1.75
Montipora	640	655	15	0.75
Dead Coral	655	695	40	2
Montipora	695	785	90	4.5
Porites	785	830	45	2.25
Dead Coral	830	850	20	1
Porites	850	870	20	1
Dead Coral	870	1010	140	7
Porites	1010	1080	70	3.5
Sand	1080	1140	60	3
Dead Coral	1140	1170	30	1.5
Porites	1170	1220	50	2.5
Dead Coral	1220	1357	137	6.85
Porites	1357	1365	8	0.4
Dead Coral	1365	1370	5	0.25
Montipora	1370	1445	75	3.75
Porites	1445	1455	10	0.5
Dead Coral	1455	1470	15	0.75
Porites	1470	1495	25	1.25
Dead Coral	1495	1510	15	0.75
Porites	1510	1555	45	2.25
Dead Coral	1555	1575	20	1
Favites	1575	1590	15	0.75
Dead Coral	1590	1640	50	2.5
Porites	1640	1700	60	3
Dead Coral	1700	1765	65	3.25
Porites	1765	1790	25	1.25
Dead Coral	1790	1870	80	4
Porites	1870	1935	65	3.25
Dead Coral	1935	2000	65	3.25
Totals			2000	100

III	intervals		(cm)	% cover
Porites	2500	2550	50	2.5
Dead Coral	2550	2560	10	0.5
Porites	2560	2630	70	3.5
Rock	2630	2690	60	3
Platygyra	2690	2700	10	0.5
Rock	2700	2715	15	0.75
Porites	2715	2755	40	2
Rock	2755	2770	15	0.75
Dead Coral	2770	2890	120	6
Porites	2890	2930	40	2
Dead Coral	2930	3025	95	4.75
Porites	3025	3110	85	4.25
Dead Coral	3110	3130	20	1
Porites	3130	3205	75	3.75
Favia	3205	3220	15	0.75
Dead Coral	3220	3240	20	1
Porites	3240	3260	20	1
Dead Coral	3260	3345	85	4.25
Porites	3345	3365	20	1
Rock	3365	3460	95	4.75
Porites	3460	3495	35	1.75
Dead Coral	3495	3520	25	1.25
Porites	3520	3570	50	2.5
Dead Coral	3570	3720	150	7.5
Porites	3720	3770	50	2.5
Dead Coral	3770	3840	70	3.5
Porites	3840	3855	15	0.75
Dead Coral	3855	3990	135	6.75
Porites	3990	4020	30	1.5
Dead Coral	4020	4090	70	3.5
Porites	4090	4105	15	0.75
Rock	4105	4230	125	6.25
Porites	4230	4245	15	0.75
Dead Coral	4245	4310	65	3.25
Porites	4310	4320	10	0.5
Rock	4320	4350	30	1.5
Acropora (corymbose)	4350	4420	70	3.5
Porites	4420	4500	80	4
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	1.17
Porites component	43.85
Faviid coral component	1.49
Other living coral component	6.83
Other sessile organism component	0.00
Dead coral component	38.77
Abiotic component	7.89
Total	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	0.00	0.00	3.50
Porites component	60.10	35.55	35.00
Faviid coral component	2.35	0.75	1.25
Other living coral component	10.00	10.00	0.00
Other sessile organism component	0.00	0.00	0.00
Dead coral component	23.30	50.70	43.25
Abiotic component	4.25	3.00	17.00
Totals	100.00	100.00	100.00

1995 Sampling
Sichang Station 2
East-side Sichang Island

I	intervals		(cm)	%cover
Dead coral	0	160	160	8
Porites	160	170	10	0.5
Dead coral	170	255	85	4.25
Porites	255	290	35	1.75
Dead coral	290	310	20	1
Porites	310	360	50	2.5
Dead coral	360	390	30	1.5
Porites	390	460	70	3.5
Dead coral	460	470	10	0.5
Platygyra	470	480	10	0.5
Dead coral	480	550	70	3.5
Porites	550	570	20	1
Rock	570	600	30	1.5
Zooanthid	600	630	30	1.5
Favia	630	650	20	1
Zooanthid	650	695	45	2.25
Dead coral	695	710	15	0.75
Porites	710	730	20	1
Dead coral	730	770	40	2
Zooanthid	770	830	60	3
Porites	830	870	40	2
Dead coral	870	885	15	0.75
Acropora (branching)	885	910	25	1.25
Dead coral	910	1050	140	7
Fungia	1050	1065	15	0.75
Dead coral	1065	1095	30	1.5
Acropora (branching)	1095	1105	10	0.5
Dead coral	1105	1170	65	3.25
Porites	1170	1195	25	1.25
Zooanthid	1195	1210	15	0.75
Porites	1210	1240	30	1.5
Dead coral	1240	1260	20	1
Zooanthid	1260	1265	5	0.25
Dead coral	1265	1340	75	3.75
Porites	1340	1370	30	1.5
Dead coral	1370	1470	100	5
Favia	1470	1510	40	2
Porites	1510	1900	390	19.5
Zooanthid	1900	2000	100	5
Totals			2000	100

II	intervals		(cm)	%cover
Porites	2500	2525	25	1.25
Rock	2525	2610	85	4.25
Zooanthid	2610	2723	113	5.65
Dead coral	2723	2785	62	3.1
Zooanthid	2785	2895	110	5.5
Rock	2895	3130	235	11.75
Zooanthid	3130	3170	40	2
Rock	3170	3190	20	1
Zooanthid	3190	3220	30	1.5
Rock	3220	3240	20	1
Zooanthid	3240	3480	240	12
Rock	3480	3490	10	0.5
Zooanthid	3490	4020	530	26.5
Rock	4020	4060	40	2
Zooanthid	4060	4135	75	3.75
Porites	4135	4195	60	3
Rock	4195	4210	15	0.75
Porites	4210	4270	60	3
Sand	4270	4315	45	2.25
Porites	4315	4410	95	4.75
Sand	4410	4500	90	4.5
Totals			2000	100

Percent area coverage of major reef components relative to 40 meter long transect

	(%)
Acropora component	0.88
Porites component	24.00
Faviid coral component	1.75
Other living coral component	0.38
Other sessile organism component	34.83
Dead coral component	23.43
Abiotic component	14.75
Total	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II
Acropora component	1.75	0.00
Porites component	36.00	12.00
Faviid coral component	3.50	0.00
Other living coral component	0.75	0.00
Other sessile organism component	12.75	56.90
Dead coral component	43.74	3.10
Abiotic component	1.50	24.90
Totals	100.00	100.00

1995 Sampling
Sichang station 3
West-side Sichang Island

I	intervals		(cm)	%cover
Porites	0	30	30	1.5
Dead coral	30	65	35	1.75
Porites	65	145	80	4
Rock	145	490	345	17.25
Platygyra	490	560	70	3.5
Favites		8	8	0.4
Rock	560	650	90	4.5
Pocillopora	650	655	5	0.25
Porites	655	705	50	2.5
Rock	705	730	25	1.25
Favites	730	738	8	0.4
Porites	738	765	27	1.35
Dead coral	765	770	5	0.25
Porites	770	780	10	0.5
Dead coral	780	800	20	1
Favites	800	810	10	0.5
Dead coral	810	820	10	0.5
Porites	320	830	10	0.5
Dead coral	830	835	5	0.25
Porites	335	840	5	0.25
Rock	340	850	10	0.5
Porites	350	875	25	1.25
Dead coral	875	880	5	0.25
Porites	380	885	5	0.25
Rock	885	970	85	4.25
Goniopora	970	995	25	1.25
Porites	995	1010	15	0.75
Porites	1010	1025	15	0.75
Platygyra	1025	1040	15	0.75
Rock	1040	1090	50	2.5
Favia	1090	1095	5	0.25
Dead coral	1095	1115	20	1
Platygyra	1115	1125	10	0.5
Dead coral	1125	1165	40	2
Sea anemone	1165	1195	30	1.5
Dead coral	1195	1220	25	1.25
Favia	1220	1235	15	0.75
Porites	1235	1260	25	1.25
Porites	1260	1365	105	5.25
Platygyra	1365	1370	5	0.25
Porites	1370	1390	20	1
Acropora (cor	1390	1450	60	3
Dead coral	1450	1450	0	0
Goniastrea	1450	1460	10	0.5
Dead coral	1460	1465	5	0.25
Favites	1460	1465	5	0.25
Dead coral	1465	1470	5	0.25
Platygyra	1470	1478	8	0.4
Dead coral	1478	1480	2	0.1
Porites	1480	1492	12	0.6
Dead coral	1492	1525	33	1.65
Porites	1525	1545	20	1
Dead coral	1545	1580	35	1.75
Porites	1580	1590	10	0.5
Dead coral	1590	1595	5	0.25
Porites	1595	1605	10	0.5
Dead coral	1605	1635	30	1.5
Hydnopora	1635	1650	15	0.75
Porites	1650	1680	30	1.5
Dead coral	1680	1740	60	3
Porites	1740	1755	15	0.75
Dead coral	1755	1770	15	0.75
Porites	1770	1840	70	3.5
Dead coral	1840	1920	80	4
Favia	1920	1930	10	0.5
Dead coral	1930	1970	40	2
Porites	1970	1975	5	0.25
Dead coral	1975	2000	25	1.25
Totals			2000	100

II	intervals		(cm)	%cover
Porites	2500	2510	10	0.5
Platygyra	2510	2535	25	1.25
Dead coral	2535	2555	20	1
Galaxea	2555	2560	5	0.25
Dead coral	2560	2630	70	3.5
Symphyllia	2630	2655	25	1.25
Rock	2655	2680	25	1.25
Favia	2680	2690	10	0.5
Porites	2690	2720	30	1.5
Dead coral	2720	2740	20	1
Pavona	2740	2745	5	0.25
Rock	2745	2810	65	3.25
Porites	2810	2870	60	3
Dead coral	2870	2910	40	2
Porites	2910	3200	290	14.5
Dead coral	3200	3240	40	2
Porites	3240	3280	40	2
Dead coral	3280	3310	30	1.5
Porites	3310	3350	40	2
Rock	3350	3650	300	15
Goniastrea	3650	3700	50	2.5
Rock	3700	3780	80	4
Goniastrea	3780	3810	30	1.5
Platygyra	3810	3840	30	1.5
Rock	3840	3910	70	3.5
Favites	3910	3925	15	0.75
Rock	3925	3935	10	0.5
Favites	3935	3940	5	0.25
Porites	3940	4060	120	6
Dead coral	4060	4110	50	2.5
Porites	4110	4190	80	4
Dead coral	4190	4240	50	2.5
Porites	4240	4270	30	1.5
Dead coral	4270	4280	10	0.5
Porites	4280	4360	80	4
Dead coral	4360	4390	30	1.5
Porites	4390	4415	25	1.25
Dead coral	4415	4470	55	2.75
Porites	4470	4500	30	1.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	35	35	1.75
Platygyra	35	60	25	1.25
Symphyllia		12	12	0.6
Platygyra		12	12	0.6
Favia		10	10	0.5
Rock		26	26	1.3
Palythoa	120	200	80	4
Dead coral	200	210	10	0.5
Porites	210	340	130	6.5
Porites	340	420	80	4
Rock	420	440	20	1
Favia	440	450	10	0.5
Porites	450	460	10	0.5
Dead coral	460	500	40	2
Porites	500	650	150	7.5
Symphyllia	650	665	15	0.75
Dead coral	665	700	35	1.75
Porites	700	730	30	1.5
Porites		7	7	0.35
Rock	737	300	63	3.15
Porites	300	840	40	2
Porites	840	860	20	1
Porites	860	860	0	0
Rock	860	900	40	2
Porites	900	940	40	2
Platygyra	940	960	20	1
Porites	960	970	10	0.5
Rock	970	1000	30	1.5
Porites	1000	1030	30	1.5
Rock	1030	1120	90	4.5
Porites	1120	1250	130	6.5
Porites	1250	1320	70	3.5
Porites	1320	1370	50	2.5
Rock	1370	1390	20	1
Porites	1390	1430	40	2
Rock	1430	1500	70	3.5
Porites	1500	1545	45	2.25
Dead coral	1545	1555	10	0.5
Favia	1555	1575	20	1
Rock	1575	1650	75	3.75
Platygyra	1650	1680	30	1.5
Porites	1680	1740	60	3
Porites	1740	1795	55	2.75
Rock	1795	1845	50	2.5
Porites	1845	1860	15	0.75
Rock	1860	2000	140	7
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	1.00
Porites component	41.14
Faviid coral component	8.53
Other living coral component	1.47
Other sessile organism component	1.83
Dead coral component	16.67
Abiotic component	29.36
Total	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	3.00	0.00	0.00
Porites component	29.70	39.37	54.35
Faviid coral component	9.95	9.03	6.35
Other living coral component	1.50	1.81	1.35
Other sessile organism component	1.50	0.00	4.00
Dead coral component	23.85	21.41	4.75
Abiotic component	30.50	28.38	29.20
Totals	100.00	100.00	100.00

1995 Sampling
Sampanjun Station4
North-side Sichang Island

I	intervals		(cm)	%cover
Platygyra	0	20	20	1
Dead coral	20	30	10	0.5
Platygyra	30	40	10	0.5
Platygyra	40	90	50	2.5
Dead coral	90	270	180	9
Favia	270	285	15	0.75
Dead coral	285	320	35	1.75
Porites	320	325	5	0.25
Dead coral	325	380	55	2.75
Porites	380	385	5	0.25
Sand	385	425	40	2
Porites	425	470	45	2.25
Zooanthid	470	580	110	5.5
Dead coral	580	620	40	2
Zooanthid	620	650	30	1.5
Platygyra	650	670	20	1
Dead coral	670	685	15	0.75
Favia	685	690	5	0.25
Dead coral	690	735	45	2.25
Platygyra	735	755	20	1
Dead coral	755	795	40	2
Palythoa	795	800	5	0.25
Dead coral	800	810	10	0.5
Symphyllia	810	840	30	1.5
Dead coral	840	845	5	0.25
Platygyra	845	870	25	1.25
Sand	870	925	55	2.75
Pocillopora	925	940	15	0.75
Sea anemone	940	950	10	0.5
Dead coral	950	960	10	0.5
Symphyllia	960	970	10	0.5
Dead coral	970	975	5	0.25
Porites	975	1000	25	1.25
Dead coral	1000	1085	85	4.25
Palythoa	1085	1140	55	2.75
Favia	1140	1150	10	0.5
Dead coral	1150	1190	40	2
Palythoa	1190	1230	40	2
Symphyllia	1230	1265	35	1.75
Palythoa	1265	1275	10	0.5
Dead coral	1275	1330	55	2.75
Platygyga	1330	1360	30	1.5
Dead coral	1360	1375	15	0.75
Platygyra	1375	1390	15	0.75
Dead coral	1390	1430	40	2
Palythoa	1430	1475	45	2.25
Turbinaria	1475	1485	10	0.5
Dead coral	1485	1605	120	6
Porites	1605	1730	125	6.25
Dead coral	1730	1770	40	2
Porites	1770	1820	50	2.5
Palythoa	1820	1840	20	1
Dead coral	1840	1895	55	2.75
Palythoa	1895	1910	15	0.75
Dead coral	1910	1940	30	1.5
Platygyra	1940	2000	60	3
Totals			2000	100

II	intervals		(cm)	%cover
Dead coral	2500	3100	600	30
Porites	3100	3140	40	2
Palythoa	3140	3305	165	8.25
Sand	3305	3340	35	1.75
Dead coral	3340	3500	160	8
Palythoa	3500	3520	20	1
Platygyra	3520	3540	20	1
Dead coral	3540	3570	30	1.5
Palythoa	3570	3630	60	3
Dead coral	3630	3650	20	1
Palythoa	3650	3660	10	0.5
Dead coral	3660	3690	30	1.5
Palythoa	3690	3760	70	3.5
Dead coral	3760	3800	40	2
Palythoa	3800	3920	120	6
Favia	3920	3930	10	0.5
Dead coral	3930	3950	20	1
Platygyra	3950	4010	60	3
Dead coral	4010	4115	105	5.25
Sinularia	4115	4130	15	0.75
Sea anemone	4130	4140	10	0.5
Softcoral	4140	4190	50	2.5
Palythoa	4190	4210	20	1
Dead coral	4210	4275	65	3.25
Goniastrea	4275	4300	25	1.25
Dead coral	4300	4330	30	1.5
Palythoa	4330	4365	35	1.75
Porites	4365	4400	35	1.75
Dead coral	4400	4470	70	3.5
Palythoa	4470	4500	30	1.5
Totals			2000	100

Percent area coverage of major reef components relative to 40 meter long transect

	(%)
Acropora component	0.00
Porites component	8.33
Faviid coral component	10.07
Other living coral component	2.48
Other sessile organism component	23.56
Dead coral component	52.33
Abiotic component	3.23
Total	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II
Acropora component	0.00	0.00
Porites component	13.00	3.75
Faviid coral component	14.50	5.75
Other living coral component	5.00	0.00
Other sessile organism component	17.00	30.25
Dead coral component	46.50	58.50
Abiotic component	4.00	1.75
Totals	100.00	100.00

1995 Sampling
Sichang station 5
Landokmai Island

I	intervals		(cm)	%cover
Porites	0	13	13	0.65
Favia	13	30	17	0.85
Symphyllia	30	40	10	0.5
Porites	40	55	15	0.75
Palythoa	55	95	40	2
Porites	95	170	75	3.75
Dead coral	170	220	50	2.5
Porites	220	235	15	0.75
Dead coral	235	310	75	3.75
Porites	310	340	30	1.5
Dead coral	340	380	40	2
Porites	380	385	5	0.25
Porites	385	395	10	0.5
Dead coral	395	450	55	2.75
Platygyra	450	480	30	1.5
Dead coral	480	490	10	0.5
Porites	490	500	10	0.5
Palythoa	500	525	25	1.25
Dead coral	525	585	60	3
Porites	585	610	25	1.25
Porites	610	650	40	2
Pocillopora	650	660	10	0.5
Favia		7	7	0.35
Symphyllia		7	7	0.35
Dead coral	674	705	31	1.55
Porites	705	780	75	3.75
Rock	780	1020	240	12
Porites	1020	1023	3	0.15
Dead coral	1023	1055	32	1.6
Porites	1055	1058	3	0.15
Rock	1058	1237	179	8.95
Porites	1237	1260	23	1.15
Rock	1260	1320	60	3
Goniopora	1320	1335	15	0.75
Rock	1335	1410	75	3.75
Porites	1410	1475	65	3.25
Porites	1475	1505	30	1.5
Rock	1505	1540	35	1.75
Favia	1540	1558	18	0.9
Dead coral	1558	1580	22	1.1
Favia	1580	1590	10	0.5
Dead coral	1590	1643	53	2.65
Porites	1643	1660	17	0.85
Rock	1660	1730	70	3.5
Turbinaria	1730	1735	5	0.25
Dead coral	1735	1760	25	1.25
Favia	1760	1765	5	0.25
Rock	1765	1820	55	2.75
Porites	1820	1825	5	0.25
Dead coral	1825	1860	35	1.75
Porites	1860	1890	30	1.5
Favites	1890	1915	25	1.25
Symphyllia	1915	1930	15	0.75
Porites	1930	1950	20	1
Dead coral	1950	1970	20	1
Porites	1970	2000	30	1.5
Totals			2000	100

II	intervals		(cm)	%cover
Favia		15	15	0.75
Palythoa		15	15	0.75
Porites	2530	2625	95	4.75
Rock	2625	2710	85	4.25
Porites	2710	2770	60	3
Favites	2770	2785	15	0.75
Rock	2785	2795	10	0.5
Leptoseris	2795	2805	10	0.5
Porites	2805	2811	6	0.3
Rock	2811	2830	19	0.95
Platygyra	2830	2845	15	0.75
Porites	2845	2860	15	0.75
Rock	2860	2910	50	2.5
Symphyllia	2910	2950	40	2
Dead coral	2950	3000	50	2.5
Porites	3000	3030	30	1.5
Dead coral	3030	3040	10	0.5
Porites	3040	3090	50	2.5
Porites	3090	3150	60	3
Porites	3150	3175	25	1.25
Dead coral	3175	3180	5	0.25
Porites	3180	3210	30	1.5
Porites	3210	3295	85	4.25
Porites	3295	3315	20	1
Dead coral	3315	3350	35	1.75
Favites	3350	3365	15	0.75
Rock	3365	3420	55	2.75
Porites	3420	3440	20	1
Porites	3440	3480	40	2
Dead coral	3480	3490	10	0.5
Porites	3490	3520	30	1.5
Sand	3520	3540	20	1
Porites	3540	3570	30	1.5
Symphyllia	3570	3580	10	0.5
Porites	3580	3620	40	2
Rock	3620	3640	20	1
Goniastrea	3640	3650	10	0.5
Rock	3650	3660	10	0.5
Porites	3660	3675	15	0.75
Rock	3675	3705	30	1.5
Favia	3705	3710	5	0.25
Rock	3710	3720	10	0.5
Favites	3720	3725	5	0.25
Rock	3725	3735	10	0.5
Favia	3735	3750	15	0.75
Rock	3750	3920	170	8.5
Porites	3920	3980	60	3
Porites	3980	3995	15	0.75
Porites	3995	4020	25	1.25
Porites	4020	4065	45	2.25
Porites	4065	4095	30	1.5
Porites	4095	4125	30	1.5
Platygyra	4125	4160	35	1.75
Porites	4160	4165	5	0.25
Dead coral	4165	4190	25	1.25
Porites	4190	4270	80	4
Porites	4270	4300	30	1.5
Porites	4300	4315	15	0.75
Porites	4315	4330	15	0.75
Porites	4330	4380	50	2.5
Favia	4380	4390	10	0.5
Rock	4390	4465	75	3.75
Porites	4465	4500	35	1.75
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	42	42	2.1
Rock	42	85	43	2.15
Porites	85	180	95	4.75
Porites	180	230	50	2.5
Dead coral	230	255	25	1.25
Favites	255	275	20	1
Porites	275	325	50	2.5
Favia	325	340	15	0.75
Porites	340	350	10	0.5
Symphyllia	350	365	15	0.75
Porites	365	380	15	0.75
Psamocora	380.	390	10	0.5
Porites	390	420	30	1.5
Porites	420	460	40	2
Platygyra	460	465	5	0.25
Porites	465	500	35	1.75
Platygyra	500	515	15	0.75
Porites	515	519	4	0.2
Porites	519	540	21	1.05
Platygyra	540	555	15	0.75
Porites	555	600	45	2.25
Porites	600	610	10	0.5
Porites	610	750	140	7
Rock	750	800	50	2.5
Porites	800	880	80	4
Porites	880	920	40	2
Rock	920	935	15	0.75
Porites	935	945	10	0.5
Rock	945	1000	55	2.75
Platygyra	1000	1040	40	2
Porites	1040	1055	15	0.75
Symphyllia	1055	1070	15	0.75
Favia	1070	1085	15	0.75
Rock	1085	1110	25	1.25
Porites	1110	1195	85	4.25
Favia	1195	1210	15	0.75
Favites	1210	1240	30	1.5
Porites	1240	1270	30	1.5
Porites	1270	1305	35	1.75
Dead coral	1305	1325	20	1
Porites	1325	1230	-95	-4.75
Rock	1230	1355	125	6.25
Porites	1355	1380	25	1.25
Porites	1380	1390	10	0.5
Favites	1390	1415	25	1.25
Rock	1415	1440	25	1.25
Porites	1440	1540	100	5
Porites	1540	1580	40	2
Porites	1580	1670	90	4.5
Rock	1670	1790	120	6
Porites	1790	1810	20	1
Rock	1810	1825	15	0.75
Porites	1825	1835	10	0.5
Goniastrea	1835	1860	25	1.25
Rock	1860	1885	25	1.25
Symphyllia	1885	1895	10	0.5
Rock	1895	1900	5	0.25
Porites	1900	1955	55	2.75
Goniastrea	1955	1960	5	0.25
Rock	1960	1970	10	0.5
Favites	1970	1990	20	1
Favia	1990	2000	10	0.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	0.00
Porites component	47.13
Faviid coral component	7.45
Other living coral component	2.94
Other sessile organism component	1.34
Dead coral component	11.48
Abiotic component	29.66
Total	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	0.00	0.00	0.00
Porites component	26.95	55.55	58.90
Faviid coral component	5.60	4.60	12.14
Other living coral component	3.10	3.32	2.38
Other sessile organism component	3.25	0.77	0.00
Dead coral component	25.40	6.91	2.14
Abiotic component	35.70	28.85	24.43
Totals	100.00	100.00	100.00

1995 Sampling
Pattaya Station 6
Nok Island

I	intervals		(cm)	%cover
Porites	0	70	70	3.5
Dead coral	70	120	50	2.5
Sand	120	230	110	5.5
Porites	230	270	40	2
Sand	270	330	60	3
Montipora		10	10	0.5
Palythoa		30	30	1.5
Dead coral	370	410	40	2
Porites	410	490	80	4
Sand	490	505	15	0.75
Porites	505	550	45	2.25
Sand	550	565	15	0.75
Porites	565	620	55	2.75
Acropora (branching form)	620	750	130	6.5
Sand	750	765	15	0.75
Porites	765	800	35	1.75
Sand	800	820	20	1
Acropora (branching form)	820	1020	200	10
Sand	1020	1100	80	4
Acropora (branching form)	1100	1150	50	2.5
Porites	1150	1285	135	6.75
Pocillopora	1285	1300	15	0.75
Dead coral	1300	1315	15	0.75
Pocillopora	1315	1320	5	0.25
Dead coral	1320	1420	100	5
Pocillopora	1420	1435	15	0.75
Dead coral	1435	1525	90	4.5
Porites	1525	1560	35	1.75
Sand	1560	1570	10	0.5
Porites	1570	1650	80	4
Dead coral	1650	1700	50	2.5
Porites	1700	1710	10	0.5
Sand	1710	1850	140	7
Porites	1850	1950	100	5
Porites	1950	2000	50	2.5
Totals			2000	100

II	intervals		(cm)	%cover
Porites	2500	2520	20	1
Acropora (tabulate form	2520	2550	30	1.5
Dead coral	2550	2570	20	1
Symphyllia		10	10	0.5
Porites	2580	2650	70	3.5
Dead coral	2650	2670	20	1
Porites	2670	3010	340	17
Dead coral	3010	3030	20	1
Porites	3030	3100	70	3.5
Dead coral	3100	3110	10	0.5
Porites	3110	3200	90	4.5
Palythoa	3200	3300	100	5
Sand	3300	3325	25	1.25
Soft coral	3325	3345	20	1
Porites	3345	3365	20	1
Dead coral	3365	3395	30	1.5
Porites	3395	3430	35	1.75
Dead coral	3430	3470	40	2
Porites	3470	3500	30	1.5
Sand	3500	4010	510	25.5
Acropora (branching)	4010	4045	35	1.75
Dead coral	4045	4200	155	7.75
Montipora	4200	4230	30	1.5
Dead coral	4230	4315	85	4.25
Porites	4315	4340	25	1.25
Zooanthid	4340	4350	10	0.5
Dead coral	4350	4390	40	2
Porites	4390	4500	110	5.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	55	55	2.75
Sand	55	110	55	2.75
Porites	110	140	30	1.5
Dead coral	140	150	10	0.5
Porites	150	210	60	3
Porites	210	225	15	0.75
Porites	225	270	45	2.25
Dead coral	270	290	20	1
Porites	290	350	60	3
Porites	350	370	20	1
Porites	370	570	200	10
Porites	570	615	45	2.25
Pocillopora	615	650	35	1.75
Porites	650	880	230	11.5
Sand	880	960	80	4
Dead coral	960	1030	70	3.5
Sand	1030	1080	50	2.5
Dead coral	1080	1130	50	2.5
Sand	1130	1160	30	1.5
Dead coral	1160	1200	40	2
Sand	1200	1220	20	1
Porites	1220	1310	90	4.5
Porites	1310	1470	160	8
Dead coral	1470	1500	30	1.5
Porites	1500	1560	60	3
Porites	1560	1880	320	16
Porites	1880	1920	40	2
Porites	1920	2000	80	4
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**7.42**
Porites component	**50.92**
Other living coral component	**2.00**
Other sessile organism component	**2.67**
Dead coral component	**16.42**
Abiotic component	**20.58**
Abiotic component	**0**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**19.00**	**3.25**	**0.00**
Porites component	**36.75**	**40.50**	**75.50**
Faviid coral component	**0.00**	**0.00**	**0.00**
Other living coral component	**2.25**	**2.00**	**1.75**
Other sessile organism component	**1.50**	**6.50**	**0.00**
Dead coral component	**17.25**	**21.00**	**11.00**
Abiotic component	**23.25**	**26.75**	**11.75**
Totals	**100.00**	**100.00**	**100.00**

1995 Sampling
Pattaya Station
Krok Island

I	intervals	(cm)		%cover
Porites	0	110	110	5.5
Dead coral	110	130	20	1
Porites	130	230	100	5
Dead coral	230	240	10	0.5
Porites	240	265	25	1.25
Pocillopora	265	270	5	0.25
Porites	270	310	40	2
Dead coral	310	340	30	1.5
Pavona	340	355	15	0.75
Galaxea	355	365	10	0.5
Dead coral	365	370	5	0.25
Porites	370	510	140	7
Dead coral	510	540	30	1.5
Porites	540	700	160	3
Symphyllia		10	10	0.5
Dead coral	710	790	80	4
Porites	790	1000	210	10.5
Porites	1000	1130	130	9
Dead coral	1180	1195	15	0.75
Porites	1195	1300	105	5.25
Dead coral	1300	1323	23	1.15
Pocillopora		7	7	0.35
Porites	1330	1410	30	4
Dead coral	1410	1440	30	1.5
Porites	1440	1460	20	1
Dead coral	1460	1500	40	2
Acropora (corymbose form)	1500	1520	20	1
Dead coral	1520	1550	30	1.5
Porites	1550	1585	35	1.75
Dead coral	1585	1600	15	0.75
Porites	1600	1715	115	5.75
Montipora	1715	1745	30	1.5
Porites	1745	1765	20	1
Montipora	1765	1825	60	3
Dead coral	1825	1835	10	0.5
Porites	1835	1925	90	4.5
Dead coral	1925	1950	25	1.25
Lobophyllia	1950	1965	15	0.75
Montipora	1965	1990	25	1.25
Dead coral	1990	2000	10	0.5
Totals			2000	100

II	intervals	(cm)		%cover
Porites	2500	2540	40	2
Dead coral	2540	2944	404	20.2
Symphyllia		16	16	0.8
Montipora	2960	2990	30	1.5
Porites	2990	3160	170	8.5
Dead coral	3160	3270	110	5.5
Montipora	3270	3340	70	3.5
Dead coral	3340	3385	45	2.25
Porites	3385	3410	25	1.25
Dead coral	3410	3430	20	1
Pavona	3430	3460	30	1.5
Dead coral	3460	3470	10	0.5
Pavona	3470	3490	20	1
Dead coral	3490	3580	90	4.5
Pavona	3580	3630	50	2.5
Dead coral	3630	3655	25	1.25
Fungia	3655	3670	15	0.75
Pavona	3670	3700	30	1.5
Platygyra	3700	3720	20	1
Porites	3720	3780	60	3
Dead coral	3780	3820	40	2
Porites	3820	3860	40	2
Dead coral	3860	3885	25	1.25
Symphyllia		5	5	0.25
Dead coral	3890	4010	120	6
Acropora (corymbose form)	4010	4035	25	1.25
Dead coral	4035	4060	25	1.25
Porites	4060	4100	40	2
Porites	4100	4120	20	1
Porites	4120	4200	80	4
Porites	4200	4330	130	6.5
Dead coral	4330	4345	15	0.75
Pocillopora	4345	4375	30	1.5
Symphyllia	4375	4385	10	0.5
Fungia	4385	4405	20	1
Dead coral	4405	4500	95	4.75
Totals			2000	100

III	intervals	(cm)		%cover
Porites	0	15	15	0.75
Favites	15	25	10	0.5
Dead coral	25	40	15	0.75
Goniastrea	40	50	10	0.5
Porites	50	55	5	0.25
Dead coral	55	70	15	0.75
Porites	70	90	20	1
Dead coral	90	170	80	4
Pocillopora	170	175	5	0.25
Porites	175	205	30	1.5
Dead coral	205	310	105	5.25
Porites	310	360	50	2.5
Dead coral	360	380	20	1
Porites	380	390	10	0.5
Dead coral	390	400	10	0.5
Porites	400	670	270	13.5
Dead coral	670	730	60	3
Porites	730	740	10	0.5
Soft coral	740	780	40	2
Pocillopora	780	810	30	1.5
Montipora	810	830	20	1
Porites	830	870	40	2
Dead coral	870	920	50	2.5
Symphyllia	920	940	20	1
Galaxea	940	960	20	1
Dead coral	960	990	30	1.5
Montipora	990	1020	30	1.5
Montipora	1020	1080	60	3
Porites		30	30	1.5
Dead coral	1130	1240	110	5.5
Porites	1240	1300	60	3
Goniastrea	1300	1310	10	0.5
Montipora	1310	1320	10	0.5
Porites	1320	1350	30	1.5
Montipora	1350	1390	40	2
Dead coral	1390	1410	20	1
Symphyllia	1410	1425	15	0.75
Porites	1425	1440	15	0.75
Dead coral	1440	1450	10	0.5
Pavona lata	1450	1465	15	0.75
Porites	1465	1480	15	0.75
Montipora	1480	1550	70	3.5
Dead coral	1550	1558	8	0.4
Favia		7	7	0.35
Fungia		5	5	0.25
Pocillopora	1570	1575	5	0.25
Porites	1575	1730	155	7.75
Platygyra	1730	1790	60	3
Porites	1790	1805	15	0.75
Montipora	1805	1810	5	0.25
Porites	1810	2000	190	9.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	0.75
Porites component	49.92
Faviid coral component	2.12
Other living coral component	14.22
Other sessile organism copmponent	0.83
Dead coral component	32.17
Abiotic component	0

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	1.00	1.25	0.00
Porites component	71.50	30.25	48.00
Faviid coral component	0.00	1.00	5.35
Other living coral component	8.85	16.30	17.50
Other sessile organism component	0.00	0.00	2.50
Dead coral component	18.65	51.20	26.65
Abiotic component	0.00	0.00	0.00
Totals	100.00	100.00	100.00

1995 Sampling
Pattaya Station 8
Lan Island (West-side)

I	intervals		(cm)	%cover
Platygyra	0	35	35	1.75
Platygyra	35	45	10	0.5
Dead coral	45	92	47	2.35
Fungia		4	4	0.2
Fungia		10	10	0.5
Acropora (branching)		9	9	0.45
Acropora (branching)		10	10	0.5
Fungia		15	15	0.75
Porites	140	160	20	1
Porites	160	190	30	1.5
Favia	190	205	15	0.75
Platygyra	205	245	40	2
Pavona	245	275	30	1.5
Montipora	275	305	30	1.5
Dead coral	305	320	15	0.75
Platygyra	320	330	10	0.5
Platygyra	330	375	45	2.25
Dead coral	375	400	25	1.25
Porites	400	448	48	2.4
Acropora (tabulate for	448	470	22	1.1
Dead coral	470	475	5	0.25
Acropora (tabulate for	475	485	10	0.5
Porites	485	490	5	0.25
Acropora (tabulate for	490	530	40	2
Porites	530	590	60	3
Dead coral	590	610	20	1
Acropora (branching)	610	680	70	3.5
Platygyra	680	760	80	4
Dead coral	760	790	30	1.5
Acropora (branching)	790	800	10	0.5
Dead coral	800	850	50	2.5
Acropora (branching)	850	875	25	1.25
Hydnophora exesa	875	885	10	0.5
Dead coral	885	910	25	1.25
Acropora (branching)	910	925	15	0.75
Dead coral	925	950	25	1.25
Acropora (branching)	950	970	20	1
Dead coral	970	990	20	1
Scapophyllia	990	1025	35	1.75
Fungia	1025	1050	25	1.25
Leptoseris	1050	1060	10	0.5
Dead coral	1060	1080	20	1
Fungia	1080	1090	10	0.5
Porites	1090	1110	20	1
Porites	1110	1115	5	0.25
Fungia	1115	1130	15	0.75
Dead coral	1130	1150	20	1
Platygyra	1150	1170	20	1
Dead coral	1170	1235	65	3.25
Fungia	1235	1250	15	0.75
Platygyra	1250	1280	30	1.5
Montipora	1280	1295	15	0.75
Platygyra	1295	1320	25	1.25
Porites	1320	1360	40	2
Montipora	1360	1380	20	1
Acropora (branching)	1380	1420	40	2
Dead coral	1420	1460	40	2
Acropora (corymbosu	1460	1510	50	2.5
Dead coral	1510	1580	70	3.5
Acropora (branching)	1580	1650	70	3.5
Acropora (branching)	1650	1900	250	12.5
Porites	1900	1930	30	1.5
Acropora (branching)	1930	2000	70	3.5
Totals			2000	100

II	intervals		(cm)	%cover
Porites	2500	2550	50	2.5
Montipora	2550	2610	60	3
Acropora (branching)	2610	2670	60	3
Dead coral	2670	2710	40	2
Acropora (branching)	2710	2740	30	1.5
Dead coral	2740	2835	95	4.75
Platygyra	2835	2855	20	1
Acropora (branching)	2855	3175	320	16
Acropora (tabulate form)	3175	3220	45	2.25
Montipora	3220	3480	260	13
Dead coral	3480	3520	40	2
Porites	3520	3545	25	1.25
Dead coral	3545	3550	5	0.25
Favites	3550	3570	20	1
Dead coral	3570	3590	20	1
Porites	3590	3650	60	3
Acropora (branching)	3650	3640	10	0.5
Galaxea	3640	3660	20	1
Acropora (branching)	3660	3735	75	3.75
Dead coral	3735	3755	20	1
Favia	3755	3780	25	1.25
Acropora (branching)	3780	3810	30	1.5
Porites	3810	3837	27	1.35
Acropora (branching)	3837	3842	5	0.25
Porites	3842	3855	13	0.65
Acropora (branching)	3855	4160	305	15.25
Fungia	4160	4170	10	0.5
Platygyra	4170	4240	70	3.5
Acropora (branching)	4240	4280	40	2
Fungia (25 indv)	4280	4480	200	10
Acropora (branching)	4480	4500	20	1
Totals			2000	100

III	intervals		(cm)	%cover
Platygyra			0	0
Acropora (branching)	0	70	70	3.5
Montipora	70	200	130	6.5
Dead coral	200	290	90	4.5
Montipora		10	10	0.5
Fungia		30	30	1.5
Acropora (branching)	330	450	120	6
Dead coral	450	500	50	2.5
Platygyra	500	520	20	1
Dead coral	520	635	115	5.75
Platygyra	635	640	5	0.25
Dead coral	640	650	10	0.5
Platygyra	650	660	10	0.5
Dead coral	660	700	40	2
Zooanthid	700	730	30	1.5
Dead coral	730	760	30	1.5
Fungia	760	780	20	1
Favia	780	800	20	1
Dead coral	800	830	30	1.5
Platygyra	830	865	35	1.75
Dead coral	865	940	75	3.75
Acropora (branching)	940	1385	445	22.25
Platygyra	1385	1420	35	1.75
Acropora (branching)	1420	1455	35	1.75
Dead coral	1455	1490	35	1.75
Acropora (branching)	1490	1710	220	11
Dead coral	1710	1745	35	1.75
Porites	1745	1760	15	0.75
Acropora (branching)	1760	1820	60	3
Fungia	1820	1850	30	1.5
Acropora (branching)	1850	1910	60	3
Fungia	1910	1920	10	0.5
Acropora (branching)	1920	1970	50	2.5
Fungia	1970	1990	20	1
Acropora (branching)	1990	2000	10	0.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	45.02
Porites component	7.47
Faviid coral component	9.67
Other living coral component	17.23
Other sessile organism component	0.50
Dead coral component	20.12
Abiotic component	0

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	35.55	46.00	53.50
Porites component	12.90	8.75	1.25
Faviid coral component	16.00	6.75	6.25
Other living coral component	11.70	27.50	12.50
Other sessile organism component	0.00	0.00	1.00
Dead coral component	23.85	11.00	25.50
Abiotic component	0.00	0.00	0.00
Totals	100.00	100.00	100.00

1995 Sampling
Pattaya Station 9
Jun Island

I	intervals		(cm)	%cover
Platygyra	0	20	20	1
Dead coral	20	35	15	0.75
Goniastrea	35	45	10	0.5
Pavona	45	55	10	0.5
Dead coral	55	60	5	0.25
Acropora (corymbose form)	60	100	40	2
Acropora (corymbose form)	100	125	25	1.25
Porites	125	155	30	1.5
Dead coral	155	170	15	0.75
Porites	170	180	10	0.5
Dead coral	180	210	30	1.5
Pocillopora	210	225	15	0.75
Dead coral	225	255	30	1.5
Porites	255	305	50	2.5
Acropora (corymbose form)	305	355	50	2.5
Acropora (corymbose form)	355	405	50	2.5
Porites	405	430	25	1.25
Goniastrea	430	450	20	1
Pocillopora	450	470	20	1
Mud	470	490	20	1
Porites	490	570	80	4
Acropora (corymbose form)	570	580	10	0.5
Cyphastrea	580	585	5	0.25
Dead coral	585	655	70	3.5
Fungia	655	665	10	0.5
Acropora (corymbose form)	665	685	20	1
Dead coral	685	700	15	0.75
Fungia	700	710	10	0.5
Dead coral	710	740	30	1.5
Fungia	740	750	10	0.5
Dead coral	750	820	70	3.5
Porites	820	830	10	0.5
Platygyra	830	860	30	1.5
Favites	860	880	20	1
Dead coral	880	885	5	0.25
Platygyra	885	910	25	1.25
Platygyra	910	940	30	1.5
Favites	940	965	25	1.25
Dead coral	965	990	25	1.25
Porites	990	1000	10	0.5
Dead coral	1000	1065	65	3.25
Acropora (corymbose form)	1065	1125	60	3
Acropora (corymbose form)	1125	1220	95	4.75
Symphyllia	1220	1230	10	0.5
Platygyra	1230	1270	40	2
Acropora (corymbose form)	1270	1310	40	2
Porites	1310	1330	20	1
Acropora (corymbose form)	1330	1480	150	7.5
Dead coral	1480	1500	20	1
Acropora (corymbose form)	1500	1540	40	2
Dead coral	1540	1570	30	1.5
Acropora (corymbose form)	1570	1610	40	2
Porites	1610	1665	55	2.75
Dead coral	1665	1700	35	1.75
Porites	1700	1710	10	0.5
Acropora (corymbose form)	1710	1725	15	0.75
Dead coral	1725	1740	15	0.75
Acropora (corymbose form)	1740	1755	15	0.75
Dead coral	1755	1795	40	2
Acropora (corymbose form)	1795	1840	45	2.25
Dead coral	1840	1980	140	7
Acropora (corymbose form)	1980	2000	20	1
Totals			2000	100

II	intervals		(cm)	%cover
Acropora (corymbose form)	2500	2530	30	1.5
Dead coral	2530	2570	40	2
Acropora (corymbose form)	2570	2620	50	2.5
Porites	2620	2640	20	1
Dead coral	2640	2660	20	1
Acropora (corymbose form)	2660	2780	120	6
Mud	2780	2820	40	2
Platygyra	2820	2830	10	0.5
Dead coral	2830	2855	25	1.25
Platygyra	2855	2865	10	0.5
Porites	2865	2910	45	2.25
Acropora (corymbose form)	2910	2950	40	2
Platygyra	2950	2970	20	1
Dead coral	2970	2990	20	1
Acropora (corymbose form)	2990	3010	20	1
Dead coral	3010	3025	15	0.75
Acropora (corymbose form)	3025	3035	10	0.5
Dead coral	3035	3050	15	0.75
Acropora (corymbose form)	3050	3060	10	0.5
Dead coral	3060	3135	75	3.75
Acropora (corymbose form)	3135	3165	30	1.5
Dead coral	3165	3220	55	2.75
Acropora (corymbose form)	3220	3250	30	1.5
Porites	3250	3285	35	1.75
Acropora (corymbose form)	3285	3325	40	2
Dead coral	3325	3340	15	0.75
Pocillopora	3340	3350	10	0.5
Acropora (corymbose form)	3350	3370	20	1
Dead coral	3370	3390	20	1
Acropora (corymbose form)	3390	3460	70	3.5
Montipora	3460	3490	30	1.5
Dead coral	3490	3500	10	0.5
Acropora (corymbose form)	3500	3570	70	3.5
Porites	3570	3600	30	1.5
Acropora (corymbose form)	3600	3640	40	2
Acropora (corymbose form)	3640	3660	20	1
Dead coral	3660	3710	50	2.5
Acropora (corymbose form)	3710	3730	20	1
Dead coral	3730	3740	10	0.5
Acropora (corymbose form)	3740	3760	20	1
Dead coral	3760	3775	15	0.75
Acropora (corymbose form)	3775	3850	75	3.75
Acropora (corymbose form)	3850	3860	10	0.5
Dead coral	3860	3870	10	0.5
Acropora (corymbose form)	3870	3885	15	0.75
Dead coral	3885	3890	5	0.25
Acropora (corymbose form)	3890	3950	60	3
Softcoral	3950	3960	10	0.5
Dead coral	3960	3995	35	1.75
Acropora (corymbose form)	3995	4005	10	0.5
Dead coral	4005	4020	15	0.75
Softcoral	4020	4030	10	0.5
Porites	4030	4080	50	2.5
Softcoral	4080	4110	30	1.5
Favites	4110	4120	10	0.5
Acropora (corymbose form)	4120	4180	60	3
Porites	4180	4195	15	0.75
Acropora (corymbose form)	4195	4330	135	6.75
Dead coral	4330	4370	40	2
Softcoral	4370	4400	30	1.5
Platygyra	4400	4450	50	2.5
Softcoral	4450	4500	50	2.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	20	20	1
Pocillopora	20	30	10	0.5
Acropora (corymbose form)	30	110	80	4
Dead coral	110	130	20	1
Porites	130	140	10	0.5
Symphyllia	140	155	15	0.75
Porites	155	175	20	1
Pocillopora	175	215	40	2
Acropora (corymbose form)	215	280	65	3.25
Dead coral	280	300	20	1
Porites	300	330	30	1.5
Softcoral	330	350	20	1
Favites	350	360	10	0.5
Dead coral	360	380	20	1
Softcoral	380	390	10	0.5
Porites	390	430	40	2
Porites	430	440	10	0.5
Dead coral	440	455	15	0.75
Porites	455	470	15	0.75
Dead coral	470	500	30	1.5
Goniastrea	500	530	30	1.5
Favia speciosa	530	545	15	0.75
Dead coral	545	560	15	0.75
Favia speciosa	560	565	5	0.25
Sea anemone	565	940	375	18.75
Acropora (branching)	940	1060	120	6
Dead coral	1060	1080	20	1
Sea anemone	1080	1110	30	1.5
Sea anemone	1110	1130	20	1
Dead coral	1130	1160	30	1.5
Symphyllia	1160	1245	85	4.25
Dead coral	1245	1350	105	5.25
Symphyllia	1350	1560	210	10.5
Platygyra	1560	1610	50	2.5
Dead coral	1610	1620	10	0.5
Acropora (corymbose form)	1620	1650	30	1.5
Sand	1650	1950	300	15
Porites	1950	2000	50	2.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**33.58**
Porites component	**11.50**
Faviid coral component	**7.17**
Other living coral component	**10.33**
Other sessile organism component	**7.58**
Dead coral component	**23.83**
Abiotic component	**0.00**
Totals	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**35.75**	**50.25**	**14.75**
Porites component	**15.00**	**9.75**	**9.75**
Faviid coral component	**11.00**	**5.00**	**5.50**
Other living coral component	**4.50**	**2.00**	**18.00**
Other sessile organism component	**0.00**	**6.50**	**22.75**
Dead coral component	**32.75**	**24.50**	**14.25**
Abiotic component	**1.00**	**2.00**	**15.00**
Totals	**100.00**	**100.00**	**100.00**

1995 Sampling
Pattaya Station 10
Sak Island

I	intervals		(cm)	%cover
Pontes	0	90	90	4.5
Pontes	90	96	6	0.3
Dead coral	96	130	34	4.2
Platygyra	180	192	12	0.6
Dead coral	192	245	53	2.65
Pontes	245	360	115	5.75
Psamocora	360	387	27	1.35
Pontes	387	450	63	3.15
Montipora	450	480	30	1.5
Pontes	480	520	40	2
Montipora	520	540	20	1
Pocillopora	540	545	5	0.25
Dead coral	545	560	15	0.75
Favia	560	580	20	1
Rock	580	628	48	2.4
Montipora	628	690	62	3.1
Sand	690	700	10	0.5
Montipora	700	710	10	0.5
Sand	710	750	40	2
Pontes	750	915	165	8.25
Montipora	915	1010	95	4.75
Sand	1010	1055	45	2.25
Montipora	1055	1135	30	4
Sand	1135	1200	65	3.25
Montipora	1200	1322	122	6.1
Sand	1322	1345	23	1.15
Montipora	1345	1365	20	1
Sand	1365	1380	15	0.75
Sponge	1380	1430	50	2.5
Montipora	1430	1470	40	2
Sand	1470	1572	102	5.1
Montipora	1572	1590	18	0.9
Rock	1590	1600	10	0.5
Montipora	1600	1620	20	1
Sand	1620	1650	30	1.5
Pavona	1650	1672	22	1.1
Sand	1672	1720	48	2.4
Porites	1720	1790	70	3.5
Dead coral	1790	1830	40	2
Montipora	1830	1865	35	1.75
Dead coral	1865	1900	35	1.75
Porites	1900	1925	25	1.25
Porites	1925	1970	45	2.25
Montipora	1970	2000	30	1.5
Totals			2000	100

II	intervals		(cm)	%cover
Montipora	2500	2530	30	1.5
Sand	2530	2670	140	7
Montipora	2670	2700	30	1.5
Dead coral	2700	2840	140	7
Montipora	2840	2870	30	1.5
Dead coral	2870	2920	50	2.5
Montipora	2920	3150	230	11.5
Dead coral	3150	3245	95	4.75
Montipora	3245	3263	18	0.9
Dead coral	3263	3340	77	3.85
Montipora	3340	3370	30	1.5
Dead coral	3370	3385	15	0.75
Montipora	3385	3410	25	1.25
Dead coral	3410	3482	72	3.6
Montipora	3482	3520	38	1.9
Dead coral	3520	3600	80	4
Montipora	3600	3645	45	2.25
Sand	3645	3855	210	10.5
Montipora	3855	3890	35	1.75
Sand	3890	4035	145	7.25
Porites	4035	4115	80	4
Montipora	4115	4125	10	0.5
Dead coral	4125	4220	95	4.75
Echinopora	4220	4305	85	4.25
Dead coral	4305	4370	65	3.25
Echinopora	4370	4430	60	3
Lithophaga sp	4430	4440	10	0.5
Echinopora	4440	4455	15	0.75
Pontes	4455	4495	40	2
Platygyra	4495	4500	5	0.25
Totals			2000	100

III	intervals		(cm)	%cover
Pontes	0	50	50	2.5
Dead coral	50	100	50	2.5
Pontes	100	290	190	9.5
Pontes	290	295	5	0.25
Pavona lata	295	300	5	0.25
Acropora branching	300	310	10	0.5
Pocillopora	310	340	30	1.5
Pavona	340	410	70	3.5
Pontes	410	550	140	7
Leptoria phrygia	550	590	40	2
Symphyllia	590	600	10	0.5
Dead coral	600	720	120	6
Pontes	720	810	90	4.5
Dead coral	810	880	70	3.5
Platygyra	880	922	42	2.1
Symphyllia	922	952	30	1.5
Montipora	952	977	25	1.25
Dead coral	977	1170	193	9.65
Pontes	1170	1280	110	5.5
Symphyllia	1280	1300	20	1
Dead coral	1300	1320	20	1
Symphyllia	1320	1340	20	1
Pontes	1340	1390	50	2.5
Hydnophora microconos	1390	1430	40	2
Dead coral	1430	1520	90	4.5
Platygyra	1520	1590	70	3.5
Dead coral	1590	1640	50	2.5
Montipora	1640	1670	30	1.5
Favia	1670	1690	20	1
Montipora	1690	1830	140	7
Dead coral	1830	1970	140	7
Pontes	1970	2000	30	1.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.17**
Porites component	**23.40**
Faviid coral component	**6.82**
Other living coral component	**25.62**
Other sessile organism component	**1.00**
Dead coral component	**27.48**
Abiotic component	**15.52**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	**II**	**III**
Acropora component	**0.00**	**0.00**	**0.50**
Porites component	**30.95**	**6.00**	**33.25**
Faviid coral component	**1.60**	**0.25**	**10.60**
Other living coral component	**31.80**	**34.05**	**19.00**
Other sessile organism component	**2.50**	**0.50**	**0.00**
Dead coral component	**11.35**	**34.50**	**36.65**
Abiotic component	**21.80**	**24.70**	**0.00**
Totals	**100.00**	**100.00**	**100.00**

1995 Sampling
Sattahip Station 11
Kham Island

I	intervals		(cm)	%cover
Echinopora	0	65	65	3.25
Dead coral	65	84	19	0.95
Fungia	84	87	3	0.15
Dead coral	87	92	5	0.25
Sea anemone	92	125	33	1.65
Dead coral	125	140	15	0.75
Sea anemone	140	185	45	2.25
Dead coral	185	195	10	0.5
Pocillopora	195	200	5	0.25
Dead coral	200	275	75	3.75
Fungites	275	280	5	0.25
Dead coral	280	290	10	0.5
Echinopora	290	385	95	4.75
Pocillopora	385	395	10	0.5
Dead coral	395	430	35	1.75
Sea anemone	430	450	20	1
Fungia	450	460	10	0.5
Dead coral	460	560	100	5
Fungia	560	575	15	0.75
Fungia	575	600	25	1.25
Fungia	600	615	15	0.75
Dead coral	615	625	10	0.5
Fungia	625	640	15	0.75
Dead coral	640	650	10	0.5
Dead coral	650	670	20	1
Fungia	670	685	15	0.75
Fungia	685	705	20	1
Acropora (branching)	705	720	15	0.75
Dead coral	720	740	20	1
Acropora (corymbose form)	740	795	55	2.75
Galaxea	795	830	35	1.75
Acropora (corymbose form)	830	850	20	1
Acropora (branching)	850	895	45	2.25
Acropora (branching)	895	940	45	2.25
Acropora (branching)	940	1120	180	9
Acropora (tabulate form)	1120	1195	75	3.75
Acropora (branching)	1195	1230	35	1.75
Acropora (corymbose form)	1230	1265	35	1.75
Fungia	1265	1280	15	0.75
Acropora (branching)	1280	1290	10	0.5
Fungia	1290	1310	20	1
Acropora (tabulate form)	1310	1330	20	1
Dead coral	1330	1350	20	1
Acropora (tabulate form)	1350	1430	80	4
Acropora (branching)	1430	1500	70	3.5
Zooanthid	1500	2000	500	25
Totals			2000	100

II	intervals		(cm)	%cover
Dead coral	2500	2525	25	1.25
Acropora (corymbose form)	2525	2540	15	0.75
Pocillopora	2540	2560	20	1
Acropora (corymbose form)	2560	2585	25	1.25
Fungia	2585	2595	10	0.5
Echinopora	2595	2640	45	2.25
Acropora (branching)	2640	2660	20	1
Zooanthid	2660	2940	280	14
Pocillopora	2940	2950	10	0.5
Zooanthid	2950	2980	30	1.5
Fungia	2980	2985	5	0.25
Zooanthid	2985	3033	48	2.4
Fungia	3033	3040	7	0.35
Dead coral	3040	3050	10	0.5
Fungia	3050	3055	5	0.25
Acropora (branching)	3055	3080	25	1.25
Fungia	3080	3090	10	0.5
Fungia	3090	3100	10	0.5
Fungia	3100	3110	10	0.5
Acropora (branching)	3110	3160	50	2.5
Acropora (branching)	3160	3420	260	13
Dead coral	3420	3470	50	2.5
Acropora (branching)	3470	3520	50	2.5
Fungia	3520	3530	10	0.5
Dead coral	3530	3725	195	9.75
Fungia	3725	3740	15	0.75
Dead coral	3740	3780	40	2
Fungia	3780	3790	10	0.5
Dead coral	3790	3840	50	2.5
Fungia	3840	3850	10	0.5
Dead coral	3850	3920	70	3.5
Pavona	3920	3940	20	1
Dead coral	3940	3950	10	0.5
Acropora (branching)	3950	3990	40	2
Dead coral	3990	4020	30	1.5
Acropora (branching)	4020	4030	10	0.5
Echinopora	4030	4040	10	0.5
Acropora (corymbose form)	4040	4060	20	1
Acropora (branching)	4060	4160	100	5
Dead coral	4160	4170	10	0.5
Acropora (branching)	4170	4185	15	0.75
Dead coral	4185	4200	15	0.75
Acropora (branching)	4200	4205	5	0.25
Dead coral	4205	4210	5	0.25
Platygyra lamellina	4210	4230	20	1
Acropora (branching)	4230	4250	20	1
Dead coral	4250	4280	30	1.5
Acropora (branching)	4280	4320	40	2
Echinopora	4320	4350	30	1.5
Dead coral	4350	4370	20	1
Acropora (branching)	4370	4390	20	1
Fungia	4390	4400	10	0.5
Acropora (branching)	4400	4500	100	5
Totals			2000	100

III	intervals		(cm)	%cover
Acropora (branching)	0	600	600	30
Acropora (branching)	600	630	30	1.5
Acropora (branching)	630	670	40	2
Acropora (branching)	670	910	240	12
Acropora (branching)	910	1040	130	6.5
Psamocora	1040	1070	30	1.5
Dead coral	1070	1240	170	8.5
Acropora (branching)	1240	1330	90	4.5
Dead coral	1330	1610	280	14
Acropora (branching)	1610	1800	190	9.5
Acropora (tabulate)	1800	1870	70	3.5
Acropora (branching)	1870	1920	50	2.5
Acropora (tabulate)	1920	1950	30	1.5
Platygyra	1950	2000	50	2.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**48.88**
Porites component	**0.00**
Faviid coral component	**6.60**
Other living coral component	**6.79**
Other sessile organism component	**15.39**
Dead coral component	**22.33**
Abiotic component	**0.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**34.25**	**40.25**	**73.50**
Porites component	**0.00**	**0.00**	**0.00**
Faviid coral component	**0.00**	**1.00**	**2.50**
Other living coral component	**18.40**	**13.35**	**1.50**
Other sessile organism component	**29.90**	**17.40**	**0.00**
Dead coral component	**17.45**	**28.00**	**22.50**
Abiotic component	**0.00**	**0.00**	**0.00**
Totals	**100.00**	**100.00**	**100.00**

1995 Sampling
Sattahip Station 12
Yoh Island

I	intervals		(cm)	%cover
Porites lutea	0	30	30	1.5
Porites lutea	30	40	10	0.5
Porites lutea	40	50	10	0.5
Platygyra	50	70	20	1
Encrusting sponge	70	110	40	2
Sand	110	140	30	1.5
Porites lutea	140	190	50	2.5
Acropora (tabulate)	190	330	140	7
Dead coral	330	345	15	0.75
Acropora (tabulate)	345	405	60	3
Acropora austera	405	420	15	0.75
Acropora (tabulate)	420	645	225	11.25
Acropora corymbose	645	665	20	1
Acropora (tabulate)	665	685	20	1
Acropora corymbose	685	740	55	2.75
Acropora corymbose	740	780	40	2
Sand	780	790	10	0.5
Platygyra	790	810	20	1
Dead coral	810	820	10	0.5
Acropora (tabulate)	820	860	40	2
Goniastrea aspera	860	880	20	1
Acropora (tabulate)	880	895	15	0.75
Porites lutea	895	930	35	1.75
Sand	930	950	20	1
Favia sp	950	960	10	0.5
Montipora tuberculosa	960	970	10	0.5
Porites australiensis	970	1000	30	1.5
Acropora (tabulate)	1000	1160	160	8
Platygyra	1160	1200	40	2
Acropora (tabulate)	1200	1245	45	2.25
Sea anemone	1245	1270	25	1.25
Acropora (tabulate)	1270	1305	35	1.75
Acropora (branching)	1305	1320	15	0.75
Acropora (tabulate)	1320	1390	70	3.5
Acropora (branching)	1390	1770	380	19
Porites lutea	1770	1820	50	2.5
Montipora tuberculosa	1820	1835	15	0.75
Sand	1835	1855	20	1
Acropora (tabulate)	1855	2000	145	7.25
Totals			2000	100

II	intervals		(cm)	%cover
Acropora (tabulate)	2500	2545	45	2.25
Dead coral	2545	2580	35	1.75
Acropora (branching)	2580	2595	15	0.75
Platygyra	2595	2655	60	3
Dead coral	2655	2675	20	1
Acropora (branching)	2675	2690	15	0.75
Dead coral	2690	2725	35	1.75
Platygyra	2725	2735	10	0.5
Dead coral	2735	2760	25	1.25
Platygyra	2760	2800	40	2
Acropora (branching)	2800	2840	40	2
Acropora (tabulate)	2840	2880	40	2
Acropora (branching)	2880	3150	270	13.5
Acropora (tabulate)	3150	3490	340	17
Platygyra	3490	3550	60	3
Sand	3550	3570	20	1
Acropora (tabulate)	3570	3770	200	10
Acropora (branching)	3770	3820	50	2.5
Acropora (tabulate)	3820	3935	115	5.75
Montipora	3935	3955	20	1
Dead coral	3955	4000	45	2.25
Platygyra	4000	4035	35	1.75
Dead coral	4035	4090	55	2.75
Fungia	4090	4105	15	0.75
Dead coral	4105	4215	110	5.5
Pavona	4215	4235	20	1
Dead coral	4235	4280	45	2.25
Fungia	4280	4290	10	0.5
Dead coral	4290	4330	40	2
Fungia	4330	4340	10	0.5
Acropora (branching)	4340	4500	160	8
Totals			2000	100

III	intervals		(cm)	%cover
Acropora (tabulate)	0	10	10	0.5
Acropora aspera	10	90	80	4
Acropora (tabulate)	90	180	90	4.5
Platygyra	180	220	40	2
Acropora (tabulate)	220	280	60	3
Acropora (branching)	280	310	30	1.5
Dead coral	310	330	20	1
Acropora (tabulate)	330	340	10	0.5
Acropora (branching)	340	380	40	2
Dead coral	380	410	30	1.5
Platygyra	410	450	40	2
Dead coral	450	540	90	4.5
Acropora (tabulate)	540	700	160	8
Acropora florida	700	770	70	3.5
Dead coral	770	790	20	1
Acropora (tabulate)	790	930	140	7
Acropora (branching)	930	960	30	1.5
Acropora (tabulate)	960	1260	300	15
Dead coral	1260	1280	20	1
Platygyra	1280	1340	60	3
Porites	1340	1360	20	1
Goniastrea	1360	1375	15	0.75
Acropora (tabulate)	1375	1770	395	19.75
Porites	1770	1830	60	3
Sand	1830	1850	20	1
Acropora (branching)	1850	1950	100	5
Dead coral	1950	2000	50	2.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**71.42**
Porites component	**4.92**
Faviid coral component	**7.83**
Other living coral component	**1.67**
Other sessile organism component	**1.08**
Dead coral component	**11.08**
Abiotic component	**2.00**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**74.00**	**64.50**	**75.75**
Porites component	**10.75**	**0.00**	**4.00**
Faviid coral component	**5.50**	**10.25**	**7.75**
Other living coral component	**1.25**	**3.75**	**0.00**
Other sessile organism component	**3.25**	**0.00**	**0.00**
Dead coral component	**1.25**	**20.50**	**11.50**
Abiotic component	**4.00**	**1.00**	**1.00**
Totals	**100.00**	**100.00**	**100.00**

1995 Sampling
Sattahip Station 13
Samaesan Island

I	intervals		(cm)	%cover
Porites	0	25	25	1.25
Dead coral	25	70	45	2.25
Porites	70	85	15	0.75
Astreopora	85	125	40	2
Dead coral	125	290	165	8.25
Astreopora	290	300	10	0.5
Dead coral	300	305	5	0.25
Astreopora	305	325	20	1
Dead coral	325	400	75	3.75
Symphyllia	400	415	15	0.75
Dead coral	415	520	105	5.25
Pavona	520	560	40	2
Dead coral	560	620	60	3
Goniastrea	620	630	10	0.5
Dead coral	630	840	210	10.5
Astreopora	840	880	40	2
Dead coral	880	1040	160	8
Pavona	1040	1045	5	0.25
Dead coral	1045	1050	5	0.25
Pavona	1050	1070	20	1
Dead coral	1070	1090	20	1
Porites	1090	1120	30	1.5
Dead coral	1120	1140	20	1
Platygyra	1140	1165	25	1.25
Dead coral	1165	1200	35	1.75
Fungia	1200	1215	15	0.75
Dead coral	1215	1255	40	2
Platygyra	1255	1275	20	1
Dead coral	1275	1300	25	1.25
Lobophyllia	1300	1320	20	1
Dead coral	1320	1460	140	7
Fungia	1460	1490	30	1.5
Dead coral	1490	1495	5	0.25
Fungia	1495	1515	20	1
Sand	1515	1520	5	0.25
Fungia	1520	1545	25	1.25
Dead coral	1545	1575	30	1.5
Fungia	1575	1605	30	1.5
Sand	1605	1610	5	0.25
Fungia	1610	1625	15	0.75
Dead coral	1625	1675	50	2.5
Fungia	1675	1685	10	0.5
Dead coral	1685	1740	55	2.75
Fungia	1740	1760	20	1
Dead coral	1760	1810	50	2.5
Pocillopora	1810	1825	15	0.75
Dead coral	1825	1860	35	1.75
Favia	1860	1870	10	0.5
Dead coral	1870	2000	130	6.5
Totals			2000	100

II	intervals		(cm)	%cover
Platygyra	2500	2515	15	0.75
Dead coral	2515	2620	105	5.25
Porites	2620	2640	20	1
Dead coral	2640	2665	25	1.25
Favia	2665	2690	25	1.25
Dead coral	2690	2850	160	3
Fungia	2850	2870	20	1
Dead coral	2870	3060	190	9.5
Platygyra	3060	3080	20	1
Dead coral	3080	3130	50	2.5
Fungia	3130	3140	10	0.5
Dead coral	3140	3225	85	4.25
Fungia	3225	3240	15	0.75
Porites	3240	3310	70	3.5
Pocillopora	3310	3340	30	1.5
Porites	3340	3380	40	2
Dead coral	3380	3500	120	6
Porites	3500	3525	25	1.25
Pocillopora	3525	3540	15	0.75
Porites	3540	3560	20	1
Dead coral	3560	3805	245	12.25
Montipora	3805	3825	20	1
Dead coral	3825	3905	80	4
Fungia	3905	3922	17	0.85
Dead coral	3922	3980	58	2.9
Favia	3980	3995	15	0.75
Dead coral	3995	4145	150	7.5
Pocillopora	4145	4160	15	0.75
Platygyra	4160	4170	10	0.5
Pavona	4170	4255	85	4.25
Dead coral	4255	4320	65	3.25
Platygyra	4320	4370	50	2.5
Dead coral	4370	4430	60	3
Platygyra	4430	4460	30	1.5
Dead coral	4460	4500	40	2
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	10	10	0.5
Dead coral	10	410	400	20
Porites	410	425	15	0.75
Goniastrea	425	460	35	1.75
Dead coral	460	970	510	25.5
Favia	970	990	20	1
Dead coral	990	995	5	0.25
Porites	995	1010	15	0.75
Porites	1010	1030	20	1
Goniopora	1030	1045	15	0.75
Dead coral	1045	1060	15	0.75
Goniopora	1060	1130	70	3.5
Goniopora	1130	1180	50	2.5
Dead coral	1180	1255	75	3.75
Porites	1255	1260	5	0.25
Dead coral	1260	1270	10	0.5
Porites	1270	1290	20	1
Dead coral	1290	1340	50	2.5
Goniastrea	1340	1380	40	2
Dead coral	1380	1400	20	1
Porites	1400	1410	10	0.5
Dead coral	1410	1610	200	10
Clavarina arabicula	1610	1630	20	1
Dead coral	1630	1680	50	2.5
Porites	1680	1710	30	1.5
Dead coral	1710	1765	55	2.75
Favia	1765	1775	10	0.5
Dead coral	1775	1830	55	2.75
Astreopora	1830	1870	40	2
Dead coral	1870	2000	130	6.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.00**
Porites component	**6.31**
Faviid coral component	**5.82**
Other living coral component	**13.45**
Other sessile organism component	**0.00**
Dead coral component	**74.25**
Abiotic component	**0.16**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	**II**	**III**
Acropora component	**0.00**	**0.00**	**0.00**
Porites component	**4.75**	**8.75**	**5.50**
Faviid coral component	**3.25**	**8.25**	**6.00**
Other living coral component	**19.50**	**11.35**	**9.75**
Other sessile organism component	**0.00**	**0.00**	**0.00**
Dead coral component	**72.00**	**71.65**	**78.75**
Abiotic component	**0.50**	**0.00**	**0.00**
Totals	**100.00**	**100.00**	**100.00**

1995 Smapling
Sattahip Station 14
Rat Island

I	intervals		(cm)	%cover
Platygyra	0	30	30	1.5
Dead coral	30	45	15	0.75
Porites	45	110	65	3.25
Sand	110	300	190	9.5
Dead coral	300	310	10	0.5
Favia sp	310	320	10	0.5
Porites	320	355	35	1.75
Sand	355	375	20	1
Dead coral	375	410	35	1.75
Galaxea	410	440	30	1.5
Dead coral	440	465	25	1.25
Favia	465	485	20	1
Dead coral	485	495	10	0.5
Pavona	495	525	30	1.5
Sand	525	550	25	1.25
Porites	550	590	40	2
Pavona	590	620	30	1.5
Sand	620	755	135	6.75
Acropora (tabulate)	755	300	45	2.25
Dead coral	300	850	50	2.5
Acropora (tabulate)	850	1040	190	9.5
Sand	1040	1090	50	2.5
Porites	1090	1120	30	1.5
Sand	1120	1125	5	0.25
Acropora (corymbose)	1125	1160	35	1.75
Sand	1160	1130	20	1
Dead coral	1130	1240	60	3
Porites	1240	1320	30	4
Sand	1320	1470	150	7.5
Porites	1470	1570	100	5
Sand	1570	1595	25	1.25
Porites	1595	1615	20	1
Dead coral	1615	1680	65	3.25
Porites	1680	1705	25	1.25
Dead coral	1705	1745	40	2
Astreopora	1745	1765	20	1
Porites	1765	1840	75	3.75
Sand	1840	1855	15	0.75
Porites	1855	1875	20	1
Dead coral	1875	1895	20	1
Porites	1895	1905	10	0.5
Porites	1905	1915	10	0.5
Dead coral	1915	1930	15	0.75
Porites	1930	1940	10	0.5
Dead coral	1940	2000	60	3
Totals			2000	100

II	intervals		(cm)	%cover
Favia	2500	2515	15	0.75
Porites	2515	2530	15	0.75
Porites	2530	2550	20	1
Sand	2550	2600	50	2.5
Pocillopora	2600	2625	25	1.25
Sand	2625	2670	45	2.25
Porites	2670	2682	12	0.6
Dead coral	2682	2845	163	8.15
Goniopora	2845	2890	45	2.25
Dead coral	2890	2940	50	2.5
Porites	2940	2950	10	0.5
Pavona	2950	2955	5	0.25
Dead coral	2955	3120	165	3.25
Sand	3120	3210	90	4.5
Porites	3210	3220	10	0.5
Dead coral	3220	3310	90	4.5
Porites	3310	3335	25	1.25
Dead coral	3335	3340	5	0.25
Pocillopora	3340	3345	5	0.25
Dead coral	3345	3630	285	14.25
Porites	3630	3665	35	1.75
Sand	3665	3880	215	10.75
Porites lichen*	3880	3940	60	3
Dead coral	3940	4155	215	10.75
Porites	4155	4230	75	3.75
Dead coral	4230	4500	270	13.5
Totals			2000	100

III	intervals		(cm)	%cover
Dead coral	0	45	45	2.25
Porites	45	60	15	0.75
Dead coral	60	160	100	5
Porites	160	175	15	0.75
Dead coral	175	210	35	1.75
Pocillopora	210	230	20	1
Dead coral	230	330	100	5
Pocillopora	330	345	15	0.75
Porites	345	430	35	4.25
Dead coral	430	470	40	2
Porites	470	430	10	0.5
Dead coral	480	540	60	3
Porites	540	600	60	3
Dead coral	600	660	60	3
Porites	660	670	10	0.5
Dead coral	670	690	20	1
Porites	690	300	110	5.5
Dead coral	800	340	40	2
Porites	840	350	10	0.5
Dead coral	850	360	10	0.5
Porites	860	880	20	1
Acropora (corymbose)	880	920	40	2
Dead coral	920	960	40	2
Porites	960	980	20	1
Pocillopora	980	990	10	0.5
Porites	990	1090	100	5
Sand	1090	1130	40	2
Porites	1130	1220	90	4.5
Dead coral	1220	1300	80	4
Sand	1300	1560	260	13
Dead coral	1560	1620	60	3
Sand	1620	1710	90	4.5
Pocillopora	1710	1720	10	0.5
Porites	1720	1760	40	2
Sand	1760	1900	140	7
Porites	1900	1930	30	1.5
Dead coral	1930	1940	10	0.5
Porites	1940	1960	20	1
Dead coral	1960	2000	40	2
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

Acropora component	**5.17**
Porites component	**23.62**
Faviid coral component	**1.25**
Other living coral component	**4.08**
Other sessile organism component	**0.00**
Dead coral component	**39.80**
Abiotic component	**26.08**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**13.50**	**0.00**	**2.00**
Porites component	**26.00**	**13.10**	**31.75**
Faviid coral component	**3.00**	**0.75**	**0.00**
Other living coral component	**5.50**	**4.00**	**2.75**
Other sessile organism component	**0.00**	**0.00**	**0.00**
Dead coral component	**20.25**	**62.15**	**37.00**
Abiotic component	**31.75**	**20.00**	**26.50**
Totals	**100.00**	**100.00**	**100.00**

1997 Sampling

1997 Sampling
Sichang station 1
Tai Tamun Island

I	intervals		(cm)	%cover
Porites	0	25	25	1.25
Rock	25	130	105	5.25
Dead coral	130	190	60	3
Porites	190	230	40	2
Porites	230	320	90	4.5
Dead coral	320	340	20	1
Sand	340	410	70	3.5
Favia	410	490	80	4
Rock	490	510	20	1
Symphyllia	510	520	10	0.5
Rock	520	550	30	1.5
Porites	550	605	55	2.75
Montipora	605	640	35	1.75
Porites	640	650	10	0.5
Dead coral	650	655	5	0.25
Symphyllia	655	680	25	1.25
Rock	680	695	15	0.75
Symphyllia	695	735	40	2
Rock	735	870	135	6.75
Porites	870	910	40	2
Rock	910	970	60	3
Pavona	970	990	20	1
Rock	990	1030	40	2
Porites	1030	1055	25	1.25
Pavona	1055	1130	75	3.75
Gravel	1130	1230	100	5
Echinopora	1230	1300	70	3.5
Platygyra	1300	1350	50	2.5
Rock	1350	1390	40	2
Podabacia crustacea	1390	1410	20	1
Rock	1410	1430	20	1
Porites	1430	1470	40	2
Porites	1470	1600	130	6.5
Porites	1600	1715	115	5.75
Porites	1715	1730	15	0.75
Pocillopora	1730	1740	10	0.5
Porites	1740	1755	15	0.75
Dead coral	1755	1770	15	0.75
Porites	1770	1810	40	2
Porites	1810	1840	30	1.5
Porites	1840	1920	80	4
Porites	1920	1960	40	2
Rock	1960	2000	40	2
Totals			2000	100

II	intervals		(cm)	%cover
Lobophyllia	2000	2020	20	1
Rock	2020	2080	60	3
Dead coral	2080	2105	25	1.25
Porites	2105	2025	-80	-4
Dead coral	2025	2040	15	0.75
Porites	2040	2070	30	1.5
Rock	2070	2285	215	10.75
Porites	2285	2320	35	1.75
Dead coral	2320	2350	30	1.5
Porites	2350	2440	90	4.5
Pocillopora	2440	2460	20	1
Porites	2460	2580	120	6
Porites	2580	2680	100	5
Porites	2680	2810	130	6.5
Porites	2810	2930	120	6
Dead coral	2930	2950	20	1
Porites	2950	3000	50	2.5
Porites	0	100	100	5
Goniopora	100	320	220	11
Gravel	320	390	70	3.5
Pavona	390	460	70	3.5
Porites	460	560	100	5
Porites	560	690	130	6.5
Pocillopora	690	715	25	1.25
Porites	715	780	65	3.25
Platygyra	780	810	30	1.5
Rock	810	820	10	0.5
Pocillopora	820	840	20	1
Rock	840	850	10	0.5
Platygyra	850	870	20	1
Porites	870	880	10	0.5
Porites	880	910	30	1.5
Porites	910	950	40	2
Montipora	950	1000	50	2.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	1000	1150	150	7.5
Gravel	1150	1380	230	11.5
Montipora	1380	1410	30	1.5
Symphyllia	1410	1430	20	1
Rock	1430	1530	100	5
Porites	1530	1615	85	4.25
Pocillopora	1615	1630	15	0.75
Porites	1630	1740	110	5.5
Rock	1740	1800	60	3
Porites	1800	1860	60	3
Rock	1860	1910	50	2.5
Porites	1910	1930	20	1
Porites	1930	2010	80	4
Rock	2010	2090	80	4
Porites	2090	2120	30	1.5
Rock	2120	2140	20	1
Pocillopora	2140	2145	5	0.25
Rock	2145	2150	5	0.25
Porites	2150	2190	40	2
Rock	2190	2300	110	5.5
Porites	2300	2340	40	2
Rock	2340	2350	10	0.5
Pocillopora	2350	2390	40	2
Porites	2390	2440	50	2.5
Porites	2440	2505	65	3.25
Rock	2505	2575	70	3.5
Porites	2575	2600	25	1.25
Rock	2600	2620	20	1
Porites	2620	2700	80	4
Rock	2700	2730	30	1.5
Porites	2730	2880	150	7.5
Porites	2880	2950	70	3.5
Porites	2950	2985	35	1.75
Goniopora	2985	3000	15	0.75
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.00**
Porites component	**49.83**
Faviid coral component	**3.00**
Other living coral component	**15.25**
Other sessile organism component	**0.00**
Dead coral component	**3.17**
Abiotic component	**28.75**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**0.00**	**0.00**	**0.00**
Porites component	**39.50**	**58.50**	**51.50**
Faviid coral component	**6.50**	**2.50**	**0.00**
Other living coral component	**15.25**	**21.25**	**9.25**
Other sessile organism component	**0.00**	**0.00**	**0.00**
Dead coral component	**5.00**	**4.50**	**0.00**
Abiotic component	**33.75**	**13.25**	**39.25**
Totals	**100.00**	**100.00**	**100.00**

1997 Sampling
Sichang Island station 2
East side

I	intervals		(cm)	%cover
Dead coral	2000	1920	80	4
Rock	1920	1885	35	1.75
Sand	1885	1850	35	1.75
Porites	1850	1820	30	1.5
Sand	1820	1745	75	3.75
Porites	1745	1700	45	2.25
Porites	1700	1755	-55	-2.75
Porites	1755	1600	155	7.75
Dead coral	1600	1570	30	1.5
Porites	1570	1500	70	3.5
Platygyra	1500	1470	30	1.5
Dead coral	1470	1400	70	3.5
Palythoa	1400	1330	70	3.5
Rock	1330	1260	70	3.5
Palythoa	1260	1250	10	0.5
Porites	1250	1220	30	1.5
Acropora (branching)	1220	1170	50	2.5
Rock	1170	1130	40	2
Acropora (branching)	1130	990	140	7
Gravel	990	980	10	0.5
Acropora (branching)	980	965	15	0.75
Sea anemone	965	950	15	0.75
Rock	950	815	135	6.75
Palythoa	815	785	30	1.5
Porites	785	745	40	2
Rock	745	680	65	3.25
Porites	680	650	30	1.5
Gravel	650	500	150	7.5
Favia	500	465	35	1.75
Porites	465	130	335	16.75
Palythoa	130	0	130	6.5
Totals			2000	100

II	intervals		(cm)	%cover
Porites	0	30	30	1.5
Rock	30	70	40	2
Palythoa	70	150	80	4
Dead coral	150	160	10	0.5
Encrusting sponge	160	170	10	0.5
Palythoa	170	210	40	2
Dead coral	210	230	20	1
Palythoa	230	350	120	6
Rock	350	700	350	17.5
Palythoa	700	720	20	1
Palythoa	720	765	45	2.25
Palythoa	765	795	30	1.5
Porites	795	800	5	0.25
Palythoa	800	1230	430	21.5
Rock	1230	1260	30	1.5
Palythoa	1260	1520	260	13
Rock	1520	1640	120	6
Porites	1640	1790	150	7.5
Sand	1790	1830	40	2
Porites	1830	1860	30	1.5
Sand	1860	2000	140	7
Totals			2000	100

Percent area coverage of major reef components relative to 40 meter long transect

	(%)
Acropora component	**6.00**
Porites component	**22.38**
Faviid coral component	**1.63**
Other living coral component	**0.00**
Other sessile organism component	**32.25**
Dead coral component	**5.25**
Abiotic component	**32.50**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II
Acropora component	**12.00**	**0.00**
Porites component	**34.00**	**10.75**
Faviid coral component	**3.25**	**0.00**
Other living coral component	**0.00**	**0.00**
Other sessile organism component	**12.75**	**51.75**
Dead coral component	**9.00**	**1.50**
Abiotic component	**29.00**	**36.00**
Totals	**100.00**	**100.00**

1997 Sampling
Sichang Station 3
West-Side Sichang Island

I	intervals		(cm)	%cover
Porites	0	40	40	1.7
Dead coral	40	150	110	4.7
Porites	150	270	120	5.1
Rock	270	300	30	1.3
Porites	300	330	30	1.3
Rock	330	400	70	3.0
Symphyllia	400	410	10	0.4
Rock	410	430	20	0.8
Porites	430	485	55	2.3
Rock	485	590	105	4.4
Porites	590	670	80	3.4
Rock	670	810	140	5.9
Porites	810	925	115	4.9
Rock	925	930	5	0.2
Porites	930	950	20	0.8
Rock	950	970	20	0.8
Turbinaria mollis	970	995	25	1.1
Porites	995	1015	20	0.8
Rock	1015	1025	10	0.4
Porites	1025	1060	35	1.5
Rock	1060	1080	20	0.8
Porites	1080	1100	20	0.8
Rock	1100	1170	70	3.0
Porites	1170	1185	15	0.6
Rock	1185	1280	95	4.0
Porites	1280	1320	40	1.7
Porites	1320	1370	50	2.1
Symphyllia	1370	1390	20	0.8
Rock	1390	1410	20	0.8
Porites	1410	1430	20	0.8
Rock	1430	1510	80	3.4
Porites	1510	1560	50	2.1
Rock	1560	1570	10	0.4
Porites	1570	1580	10	0.4
Favia	1580	1590	10	0.4
Rock	1590	1600	10	0.4
Porites	1600	1655	55	2.3
Rock	1655	1720	65	2.8
Porites	1720	1725	5	0.2
Rock	1725	1740	15	0.6
Porites	1740	1780	40	1.7
Rock	1780	1800	20	0.8
Porites	1800	2100	300	12.7
Symphyllia	2100	2125	25	1.1
Rock	2125	2145	20	0.8
Favia	2145	2160	15	0.6
Rock	2160	2180	20	0.8
Porites	2180	2190	10	0.4
Rock	2190	2200	10	0.4
Porites	2200	2250	50	2.1
Porites	2250	2285	35	1.5
Rock	2285	2360	75	3.2
Totals			2000	100

II	intervals		(cm)	%cover
Dead coral	0	10	10	0.5
Porites	10	30	20	1
Porites	30	70	40	2
Rock	70	110	40	2
Porites	110	130	20	1
Rock	130	150	20	1
Porites	150	175	25	1.25
Rock	175	195	20	1
Porites	195	280	85	4.25
Rock	280	380	100	5
Porites	380	470	90	4.5
Rock	470	500	30	1.5
Porites	500	650	150	7.5
Rock	650	710	60	3
Porites	710	750	40	2
Rock	750	790	40	2
Platygyra	790	830	40	2
Rock	830	840	10	0.5
Favites	840	865	25	1.25
Rock	865	950	85	4.25
Porites	950	990	40	2
Platygyra	990	1051	61	3.05
Rock	1051	1040	-11	-0.55
Porites	1040	1075	35	1.75
Favia	1075	1085	10	0.5
Rock	1085	1090	5	0.25
Porites	1090	1110	20	1
Rock	1110	1120	10	0.5
Porites	1120	1160	40	2
Dead coral	1160	1185	25	1.25
Porites	1185	1200	15	0.75
Porites	1200	1250	50	2.5
Rock	1250	1290	40	2
Porites	1290	1590	300	15
Rock	1590	1710	120	6
Porites	1710	1720	10	0.5
Platygyra	1720	1740	20	1
Rock	1740	1780	40	2
Psamocora	1780	1790	10	0.5
Rock	1790	1800	10	0.5
Porites	1800	1815	15	0.75
Rock	1815	1825	10	0.5
Favites	1825	1845	20	1
Symphyllia	1845	1855	10	0.5
Platygyra	1855	1870	15	0.75
Rock	1870	1880	10	0.5
Galazea	1880	1940	60	3
Rock	1940	1950	10	0.5
Platygyra	1950	1970	20	1
Porites	1970	2000	30	1.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	30	30	1.5
Dead coral	30	50	20	1
Rock	50	130	80	4
Porites	130	150	20	1
Rock	150	170	20	1
Porites	170	190	20	1
Rock	190	250	60	3
Favites	250	270	20	1
Favia	270	280	10	0.5
Porites	280	310	30	1.5
Dead coral	310	320	10	0.5
Porites	320	340	20	1
Rock	340	435	95	4.75
Porites	435	470	35	1.75
Rock	470	520	50	2.5
Platygyra	520	540	20	1
Rock	540	560	20	1
Platygyra	560	575	15	0.75
Acropora (corymbose form)	575	640	65	3.25
Porites	640	660	20	1
Porites	660	800	140	7
Favia	800	820	20	1
Rock	820	840	20	1
Sea anemone	840	880	40	2
Dead coral	880	900	20	1
Platygyra	900	910	10	0.5
Rock	910	960	50	2.5
Favites	960	970	10	0.5
Favites	970	975	5	0.25
Rock	975	1010	35	1.75
Porites	1010	1050	40	2
Rock	1050	1125	75	3.75
Porites	1125	1140	15	0.75
Favites	1140	1155	15	0.75
Porites	1155	1165	10	0.5
Rock	1165	1270	105	5.25
Porites	1270	1300	30	1.5
Rock	1300	1315	15	0.75
Porites	1315	1325	10	0.5
Rock	1325	1365	40	2
Acropora (corymbose form)	1365	1385	20	1
Rock	1385	1470	85	4.25
Platygyra	1470	1550	80	4
Rock	1550	1560	10	0.5
Platygyra	1560	1600	40	2
Rock	1600	1885	285	14.25
Pocillopora	1885	1920	35	1.75
Porites	1920	2000	80	4
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**1.41**
Porites component	**40.16**
Faviid coral component	**7.79**
Other living coral component	**3.25**
Other sessile organism component	**0.66**
Dead coral component	**15.06**
Abiotic component	**31.66**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**0.00**	**0.00**	**4.23**
Porites component	**51.48**	**51.25**	**25.38**
Faviid coral component	**1.06**	**8.75**	**12.21**
Other living coral component	**3.39**	**4.00**	**1.74**
Other sessile organism component	**0.00**	**0.00**	**1.99**
Dead coral component	**4.66**	**1.75**	**2.49**
Abiotic component	**39.41**	**34.25**	**51.96**
Totals	**100.00**	**100.00**	**100.00**

1997 Sampling
Sichang Island Station 4
Sampanju

	intervals		(cm)	%cover
Porites	0	230	230	11.5
Acropora (tabulate form)	230	280	50	2.5
Rock	280	395	115	5.75
Palythoa	395	400	5	0.25
Rock	400	410	10	0.5
Palythoa	410	420	10	0.5
Porites	420	440	20	1
Palythoa	440	450	10	0.5
Porites	450	640	190	9.5
Favia	640	660	20	1
Rock	660	685	25	1.25
Favia	685	700	15	0.75
Rock	700	745	45	2.25
Platygyra	745	760	15	0.75
Rock	760	770	10	0.5
Platygyra	770	800	30	1.5
Porites	800	930	130	6.5
Platygyra	930	970	40	2
Porites	970	1020	50	2.5
Palythoa	1020	1050	30	1.5
Rock	1050	1055	5	0.25
Pocillopora	1055	1060	5	0.25
Rock	1060	1080	20	1
Platygyra	1080	1120	40	2
Palythoa	1120	1140	20	1
Porites	1140	1240	100	5
Rock	1240	1370	130	6.5
Galaxea	1370	1400	30	1.5
Porites	1400	1410	10	0.5
Rock	1410	1435	25	1.25
Platygyra	1435	1465	30	1.5
Porites	1465	1490	25	1.25
Palythoa	1490	1500	10	0.5
Rock	1500	1520	20	1
Palythoa	1520	1540	20	1
Pocillopora	1540	1575	35	1.75
Palythoa	1575	1585	10	0.5
Platygyra	1585	1600	15	0.75
Porites	1600	1720	120	6
Palythoa	1720	1830	110	5.5
Symphyllia	1830	1840	10	0.5
Rock	1840	1870	30	1.5
Montipora	1870	1960	90	4.5
Favia	1960	1980	20	1
Rock	1980	2000	20	1
Totals			2000	100

Percent area coverage of major reef components relative to 20 meter long transect

	(%)
Acropora component	**2.50**
Porites component	**43.75**
Faviid coral component	**10.50**
Other living coral component	**9.25**
Other sessile organism component	**11.25**
Dead coral component	**0.00**
Abiotic component	**22.75**

1997 Sampling
Sichang Station 5
Landokmai

I	intervals		(cm)	%cover
Porites	2200	2175	25	1.1
Rock	2175	2140	35	1.6
Porites	2140	2120	20	0.9
Porites	2120	2115	5	0.2
Rock	2115	2080	35	1.6
Porites	2080	2045	35	1.6
Rock	2045	2000	45	2.0
Porites	2000	1960	40	1.8
Rock	1960	1890	70	3.2
Favites	1890	1880	10	0.5
Porites	1880	1860	20	0.9
Rock	1860	1820	40	1.8
Porites	1820	1790	30	1.4
Rock	1790	1730	60	2.7
Porites	1730	1440	290	13.2
Favia	1440	1420	20	0.9
Favites	1420	1390	30	1.4
Rock	1390	1370	20	0.9
Porites	1370	1315	55	2.5
Rock	1315	1195	120	5.5
Porites	1195	1150	45	2.0
Porites	1150	1110	40	1.8
Rock	1110	1060	50	2.3
Porites	1060	1040	20	0.9
Rock	1040	1030	10	0.5
Platygyra	1030	985	45	2.0
Rock	985	960	25	1.1
Favia	960	950	10	0.5
Rock	950	910	40	1.8
Porites	910	870	40	1.8
Sand	870	850	20	0.9
Porites	850	830	20	0.9
Rock	830	740	90	4.1
Porites	740	590	150	6.8
Porites	590	555	35	1.6
Platygyra	555	530	25	1.1
Porites	530	500	30	1.4
Porites	500	430	70	3.2
Porites	430	390	40	1.8
Psamocora	390	370	20	0.9
Porites	370	350	20	0.9
Porites	350	260	90	4.1
Favia	260	245	15	0.7
Porites	245	150	95	4.3
Porites	150	0	150	6.8
Totals			2000	100

II	intervals		(cm)	%cover
Porites	0	70	70	3.5
Rock	70	110	40	2
Porites	110	210	100	5
Porites	210	320	110	5.5
Porites	320	350	30	1.5
Platygyra	350	390	40	2
Porites	390	410	20	1
Porites	410	530	120	6
Porites	530	600	70	3.5
Rock	600	695	95	4.75
Favites	695	700	5	0.25
Porites	700	730	30	1.5
Rock	730	765	35	1.75
Favia	765	775	10	0.5
Rock	775	800	25	1.25
Rock	800	825	25	1.25
Porites	825	845	20	1
Goniastrea	845	870	25	1.25
Porites	870	915	45	2.25
Symphyllia	915	925	10	0.5
Porites	925	945	20	1
Pocillopora	945	955	10	0.5
Porites	955	975	20	1
Porites	975	1010	35	1.75
Porites	1010	1060	50	2.5
Rock	1060	1100	40	2
Favia	1100	1130	30	1.5
Rock	1130	1140	10	0.5
Favites	1140	1180	40	2
Rock	1180	1210	30	1.5
Porites	1210	1460	250	12.5
Rock	1460	1485	25	1.25
Porites	1485	1520	35	1.75
Rock	1520	1615	95	4.75
Porites	1615	1635	20	1
Encrusting spo	1635	1650	15	0.75
Porites	1650	1680	30	1.5
Rock	1680	1700	20	1
Goniastrea	1700	1735	35	1.75
Rock	1735	1760	25	1.25
Porites	1760	1790	30	1.5
Rock	1790	1800	10	0.5
Palythoa	1800	1830	30	1.5
Dead coral	1830	1900	70	3.5
Rock	1900	2000	100	5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	40	40	2
Rock	40	60	20	1
Porites	60	90	30	1.5
Porites	90	100	10	0.5
Porites	100	180	80	4
Rock	180	195	15	0.75
Porites	195	200	5	0.25
Rock	200	410	210	10.5
Porites	410	500	90	4.5
Rock	500	525	25	1.25
Porites	525	600	75	3.75
Rock	600	650	50	2.5
Porites	650	710	60	3
Rock	710	760	50	2.5
Porites	760	780	20	1
Rock	780	870	90	4.5
Pocillopora	870	880	10	0.5
Gravel	880	980	100	5
Porites	980	1050	70	3.5
Gravel	1050	1220	170	8.5
Porites	1220	1310	90	4.5
Porites	1310	1360	50	2.5
Porites	1360	1400	40	2
Porites	1400	1430	30	1.5
Gravel	1430	1460	30	1.5
Porites	1460	1480	20	1
Dead coral	1480	1490	10	0.5
Platygyra	1490	1540	50	2.5
Gravel	1540	1750	210	10.5
Platygyra	1750	1800	50	2.5
Dead coral	1800	1880	80	4
Palythoa	1880	1920	40	2
Dead coral	1920	1960	40	2
Porites	1960	2000	40	2
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.00**
Porites component	**51.55**
Faviid coral component	**7.08**
Other living coral component	**0.97**
Other sessile organism component	**1.42**
Dead coral component	**3.33**
Abiotic component	**35.66**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**0.00**	**0.00**	**0.00**
Porites component	**62.39**	**54.75**	**37.50**
Faviid coral component	**6.98**	**9.25**	**5.00**
Other living coral component	**0.90**	**1.50**	**0.50**
Other sessile organism component	**0.00**	**2.25**	**2.00**
Dead coral component	**0.00**	**3.50**	**6.50**
Abiotic component	**29.73**	**28.75**	**48.50**
Totals	**100.00**	**100.00**	**100.00**

1997 Sampling
Pataya Station 6
Nok Island

I	intervals		(cm)	%cover
Porites	2000	1950	50	2.5
Gravel	1950	1920	30	1.5
Porites	1920	1875	45	2.25
Gravel	1875	1840	35	1.75
Porites	1840	1830	10	0.5
Gravel	1830	1820	10	0.5
Porites	1820	1795	25	1.25
Gravel	1795	1695	100	5
Porites	1695	1670	25	1.25
Gravel	1670	1630	40	2
Palythoa	1630	1600	30	1.5
Porites	1600	1510	90	4.5
Porites	1510	1480	30	1.5
Gravel	1480	1465	15	0.75
Porites	1465	1415	50	2.5
Gravel	1415	1250	165	8.25
Porites	1250	1190	60	3
Rock	1190	1170	20	1
Porites	1170	1165	5	0.25
Gravel	1165	1050	115	5.75
Palythoa	1050	1000	50	2.5
Porites	1000	990	10	0.5
Gravel	990	890	100	5
Porites	890	875	15	0.75
Gravel	875	850	25	1.25
Porites	850	835	15	0.75
Gravel	835	775	60	3
Porites	775	750	25	1.25
Palythoa	750	650	100	5
Gravel	650	640	10	0.5
Symphyllia	640	620	20	1
Porites	620	590	30	1.5
Palythoa	590	515	75	3.75
Gravel	515	380	135	6.75
Porites	380	290	90	4.5
Gravel	290	225	65	3.25
Porites	225	215	10	0.5
Gravel	215	30	185	9.25
Porites	30	0	30	1.5
Totals			2000	100

II	intervals		(cm)	%cover
Porites	0	35	35	1.7
Gravel	35	80	45	2.2
Favites	80	110	30	1.5
Gravel	110	395	285	14.0
Acropora (corymbose)	395	435	40	2.0
Gravel	435	470	35	1.7
Porites	470	475	5	0.2
Gravel	475	540	65	3.2
Porites	540	600	60	2.9
Rock	600	780	180	8.8
Porites	780	830	50	2.5
Rock	830	1010	180	8.8
Goniastrea	1010	1030	20	1.0
Rock	1030	1040	10	0.5
Favia	1040	1050	10	0.5
Rock	1050	1070	20	1.0
Porites	1070	1085	15	0.7
Rock	1085	1160	75	3.7
Favia	1160	1190	30	1.5
Rock	1190	1200	10	0.5
Favia	1200	1205	5	0.2
Gravel	1205	1450	245	12.0
Porites	1450	1480	30	1.5
Gravel	1480	1950	470	23.0
Porites	1950	2010	60	2.9
Rock	2010	2020	10	0.5
Porites	2020	2040	20	1.0
Totals			2000	100

III	intervals		(cm)	%cover
Goniastrea	0	30	30	1.5
Pocillopora	30	40	10	0.5
Porites	40	50	10	0.5
Gravel	50	80	30	1.5
Porites	80	100	20	1
Gravel	100	160	60	3
Platygyra	160	185	25	1.25
Gravel	185	210	25	1.25
Porites	210	240	30	1.5
Gravel	240	270	30	1.5
Porites	270	290	20	1
Gravel	290	315	25	1.25
Porites	315	345	30	1.5
Gravel	345	370	25	1.25
Porites	370	405	35	1.75
Porites	405	455	50	2.5
Gravel	455	465	10	0.5
Porites	465	560	95	4.75
Gravel	560	585	25	1.25
Porites	585	650	65	3.25
Sand	650	730	80	4
Porites	730	760	30	1.5
Dead coral	760	770	10	0.5
Porites	770	825	55	2.75
Rock	825	910	85	4.25
Porites	910	930	20	1
Rock	930	960	30	1.5
Palythoa	960	1060	100	5
Rock	1060	1070	10	0.5
Platygyra	1070	1110	40	2
Palythoa	1110	1150	40	2
Rock	1150	1320	170	8.5
Porites	1320	1340	20	1
Porites	1340	1430	90	4.5
Rock	1430	1500	70	3.5
Palythoa	1500	1540	40	2
Rock	1540	1550	10	0.5
Favites	1550	1565	15	0.75
Favites	1565	1570	5	0.25
Favites	1570	1600	30	1.5
Porites	1600	1645	45	2.25
Symphyllia	1645	1680	35	1.75
Favites	1680	1710	30	1.5
Porites	1710	1730	20	1
Rock	1730	1775	45	2.25
Porites	1775	1780	5	0.25
Rock	1780	1840	60	3
Psamocora	1840	1850	10	0.5
Rock	1850	1875	25	1.25
Porites	1875	1895	20	1
Rock	1895	1940	45	2.25
Porites	1940	1970	30	1.5
Sand	1970	2000	30	1.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.65**
Porites component	**26.24**
Faviid coral component	**4.47**
Other living coral component	**1.25**
Other sessile organism component	**7.25**
Dead coral component	**0.17**
Abiotic component	**59.97**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**0.00**	**1.96**	**0.00**
Porites component	**30.75**	**13.48**	**34.50**
Faviid coral component	**0.00**	**4.66**	**8.75**
Other living coral component	**1.00**	**0.00**	**2.75**
Other sessile organism component	**12.75**	**0.00**	**9.00**
Dead coral component	**0.00**	**0.00**	**0.50**
Abiotic component	**55.50**	**79.90**	**44.50**
Totals	**100.00**	**100.00**	**100.00**

1997 Sampling
Pattaya Station 7
Krok Island

I	intervals		(cm)	%cover
Porites	2000	1965	35	1.75
Dead coral	1965	1925	40	2
	1925	1910	15	0.75
Porites	1910	1830	80	4
Pocillopora	1830	1820	10	0.5
Porites	1820	1810	10	0.5
Platygyra	1810	1790	20	1
Dead coral	1790	1770	20	1
Porites	1770	1740	30	1.5
Pocillopora	1740	1730	10	0.5
Porites	1730	1670	60	3
Dead coral	1670	1650	20	1
Pavona	1650	1640	10	0.5
Symphyllia	1640	1630	10	0.5
Dead coral	1630	1610	20	1
Porites	1610	1600	10	0.5
Pavona	1600	1570	30	1.5
Dead coral	1570	1560	10	0.5
Pavona	1560	1510	50	2.5
Dead coral	1510	1500	10	0.5
Pavona	1500	1475	25	1.25
Porites	1475	1450	25	1.25
Pavona	1450	1430	20	1
Porites	1430	1420	10	0.5
Montipora	1420	1400	20	1
Montipora	1400	1380	20	1
Dead coral	1380	1350	30	1.5
Pocillopora	1350	1340	10	0.5
Porites	1340	1310	30	1.5
Porites	1310	1265	45	2.25
Dead coral	1265	1230	35	1.75
Pavona	1230	1220	10	0.5
Symphyllia	1220	1190	30	1.5
Dead coral	1190	1160	30	1.5
Porites	1160	1145	15	0.75
Dead coral	1145	960	185	9.25
Porites	960	920	40	2
Dead coral	920	855	65	3.25
Porites	855	845	10	0.5
Pavona	845	790	55	2.75
Pavona	790	760	30	1.5
Pocillopora	760	740	20	1
Pavona	740	715	25	1.25
Dead coral	715	700	15	0.75
Pavona	700	695	5	0.25
Porites	695	650	45	2.25
Pavona	650	630	20	1
Porites	630	610	20	1
Pavona	610	550	60	3
Favites	550	530	20	1
Dead coral	530	505	25	1.25
Montipora	505	490	15	0.75
Porites	490	420	70	3.5
Dead coral	420	400	20	1
Porites	400	390	10	0.5
Dead coral	390	380	10	0.5
Pavona	380	365	15	0.75
Dead coral	365	345	20	1
Pavona	345	325	20	1
Porites	325	315	10	0.5
Dead coral	315	305	10	0.5
Porites	305	270	35	1.75
Dead coral	270	260	10	0.5
Platygyra	260	230	30	1.5
Porites	230	200	30	1.5
Dead coral	200	70	130	6.5
Porites	70	0	70	3.5
Totals			2000	100

II	intervals		(cm)	%cover
Porites	2000	1970	30	1.5
Dead coral	1970	1955	15	0.75
Psamocora	1955	1925	30	1.5
Montipora	1925	1910	15	0.75
Dead coral	1910	1880	30	1.5
Symphyllia	1880	1870	10	0.5
Porites	1870	1845	25	1.25
Montipora	1845	1790	55	2.75
Dead coral	1790	1745	45	2.25
Porites	1745	1715	30	1.5
Porites	1715	1700	15	0.75
Acropora (branching)	1700	1655	45	2.25
Dead coral	1655	1630	25	1.25
Favia	1630	1610	20	1
Dead coral	1610	1570	40	2
Porites	1570	1555	15	0.75
Dead coral	1555	1540	15	0.75
Porites	1540	1530	10	0.5
Dead coral	1530	1380	150	7.5
Pavona	1380	1350	30	1.5
Porites	1350	1320	30	1.5
Dead coral	1320	1300	20	1
Porites	1300	1260	40	2
Pavona	1260	1230	30	1.5
Montipora	1230	1180	50	2.5
Dead coral	1180	1125	55	2.75
Pavona	1125	1095	30	1.5
Dead coral	1095	1070	25	1.25
Porites	1070	970	100	5
Dead coral	970	930	40	2
Porites	930	885	45	2.25
Platygyra	885	840	45	2.25
Porites	840	660	180	9
Dead coral	660	500	160	8
Porites	500	460	40	2
Dead coral	460	380	80	4
Porites	380	360	20	1
Dead coral	360	180	180	9
Porites	180	160	20	1
Dead coral	160	70	90	4.5
Pocillopora	70	50	20	1
Porites	50	0	50	2.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	80	80	4
Dead coral	80	185	105	5.25
Porites	185	240	55	2.75
Porites	240	290	50	2.5
Montipora	290	345	55	2.75
Porites	345	370	25	1.25
Montipora	370	400	30	1.5
Porites	400	580	180	9
Dead coral	580	620	40	2
Galaxea	620	630	10	0.5
Dead coral	630	690	60	3
Porites	690	790	100	5
Pocillopora	790	800	10	0.5
Dead coral	800	830	30	1.5
Porites	830	1340	510	25.5
Dead coral	1340	1380	40	2
Porites	1380	1470	90	4.5
Goniastrea	1470	1490	20	1
Porites	1490	1510	20	1
Pavona	1510	1530	20	1
Porites	1530	1620	90	4.5
Pocillopora	1620	1650	30	1.5
Porites	1650	1760	110	5.5
Dead coral	1760	1780	20	1
Porites	1780	2000	220	11
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	0.75
Porites component	47.83
Faviid coral component	2.58
Other living coral component	16.00
Other sessile organism component	0.00
Dead coral component	32.83
Abiotic component	0.00

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	0.00	2.25	0.00
Porites component	34.50	32.50	76.50
Faviid coral component	3.50	3.25	1.00
Other living coral component	26.75	13.50	7.75
Other sessile organism component	0.00	0.00	0.00
Dead coral component	35.25	48.50	14.75
Abiotic component	0.00	0.00	0.00
Totals	100.00	100.00	100.00

1997 Sampling
Pattaya Station S
Lan Island on West-side

I	intervals		(cm)	%cover
Dead coral	2000	1990	10	0.5
Pontes	1990	1980	10	0.5
Dead coral	1980	1960	20	1
Pontes	1960	1950	10	0.5
Dead coral	1950	1885	65	3.25
Pontes	1885	1870	15	0.75
Sand	1870	1770	100	5
Dead coral	1770	1700	70	3.5
Sand	1700	1660	40	2
Pontes	1660	1630	30	1.5
Zooanthid	1630	1360	270	13.5
Pontes	1360	1330	30	1.5
Zooanthid	1330	1310	20	1
Pontes	1310	1255	55	2.75
Zooanthid	1255	1150	105	5.25
Pontes	1150	1090	60	3
Dead coral	1090	1070	20	1
Pontes	1070	1045	25	1.25
Zooanthid	1045	1025	20	1
Pontes	1025	900	125	6.25
Zooanthid	900	360	40	2
Sand	360	310	50	2.5
Dead coral	310	300	10	0.5
Sand	300	760	40	2
Dead coral	760	750	10	0.5
Sand	750	690	60	3
Zooanthid	690	320	370	18.5
Montipora	320	310	10	0.5
Zooanthid	310	190	120	6
Sand	190	0	190	9.5
Totals			2000	100

II	intervals		(cm)	%cover
Sand	2000	1985	15	0.75
Pavona	1985	1970	15	0.75
Zooanthid	1970	1835	135	6.75
Acropora (corymbose)	1835	1820	15	0.75
Zooanthid	1820	1790	30	1.5
Acropora (corymbose)	1790	1775	15	0.75
Zooanthid	1775	1495	280	14
Platygyra	1495	1450	45	2.25
Zooanthid	1450	1350	100	5
Montipora	1350	1330	20	1
Acropora (corymbose)	1330	1320	10	0.5
Zooanthid	1320	1270	50	2.5
Montipora	1270	1255	15	0.75
Zooanthid	1255	1245	10	0.5
Montipora	1245	1175	70	3.5
Zooanthid	1175	1130	45	2.25
Dead coral	1130	1070	60	3
Zooanthid	1070	960	110	5.5
Sand	960	940	20	1
Zooanthid	940	915	25	1.25
Zooanthid	915	710	205	10.25
Montipora	710	630	80	4
Zooanthid	630	250	380	19
Sand	250	150	100	5
Montipora	150	120	30	1.5
Zooanthid	120	80	40	2
Sand	80	30	50	2.5
Platygyra	30	0	30	1.5
Totals			2000	100

III	intervals		(cm)	%cover
Platygyra	0	30	30	1.5
Sand	30	100	70	3.5
Zooanthid	100	140	40	2
Montipora	140	145	5	0.25
Zooanthid	145	220	75	3.75
Montipora	220	270	50	2.5
Acropora (branching)	270	330	60	3
Sand	330	400	70	3.5
Zooanthid	400	440	40	2
Sand	440	470	30	1.5
Zooanthid	470	500	30	1.5
Sand	500	520	20	1
Acropora (branching)	520	560	40	2
Dead coral	560	600	40	2
Montipora	600	630	30	1.5
Dead coral	630	635	5	0.25
Montipora	635	645	10	0.5
Zooanthid	645	950	305	15.25
Goniastrea	950	985	35	1.75
Zooanthid	985	1310	325	16.25
Sand	1310	1510	200	10
Montipora	1510	1570	60	3
Sand	1570	1650	80	4
Zooanthid	1650	1670	20	1
Sand	1670	1820	150	7.5
Acropora (branching)	1820	2000	180	9
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	5.33
Porites component	6.00
Faviid coral component	2.33
Other living coral component	6.58
Other sessile organism component	53.17
Dead coral component	5.17
Abiotic component	21.42
Total	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	0.00	2.00	14.00
Porites component	18.00	0.00	0.00
Faviid coral component	0.00	3.75	3.25
Other living coral component	0.50	11.50	7.75
Other sessile organism component	47.25	70.50	41.75
Dead coral component	10.25	3.00	2.25
Abiotic component	24.00	9.25	31.00
Totals	100.00	100.00	100.00

1997 Sampling
Pattaya Station 9
Jun Island

I	intervals		(cm)	%cover
Pontes	0	50	50	2.5
Rock	50	70	20	1
Pocillopora	70	80	10	0.5
Rock	80	140	60	3
Pontes	140	175	35	1.75
Acropora (tabulate form	175	200	25	1.25
Sand	200	350	150	7.5
Pontes	350	370	20	1
Sand	370	390	20	1
Dead coral	310	370	60	3
Montipora	370	510	140	7
Pontes	510	550	40	2
Pontes	550	600	50	2.5
Dead coral	600	610	10	0.5
Pontes	610	620	10	0.5
Dead coral	620	680	60	3
Pontes	680	690	10	0.5
Dead coral	690	770	80	4
Sinularia	770	780	10	0.5
Encrusting sponge	780	800	20	1
Sinularia	800	820	20	1
Pontes	820	860	40	2
Acropora (corymbose)	860	900	40	2
Pontes	900	920	20	1
Dead coral	920	950	30	1.5
Zooanthid	950	990	40	2
Dead coral	990	1000	10	0.5
Pontes	1000	1020	20	1
Platygyra	1020	1060	40	2
Favites	1060	1080	20	1
Dead coral	1080	1090	10	0.5
Montipora	1090	1175	85	4.25
Dead coral	1175	1210	35	1.75
Pocillopora	1210	1220	10	0.5
Pontes	1220	1260	40	2
Acropora (corymbose)	1260	1270	10	0.5
Pontes	1270	1310	40	2
Pontes	1310	1330	20	1
Dead coral	1330	1360	30	1.5
Coscinaraea	1360	1400	40	2
Montipora	1400	1430	30	1.5
Dead coral	1430	1500	70	3.5
Pontes	1500	1520	20	1
Dead coral	1520	1540	20	1
Pontes	1540	1755	215	10.75
Montipora	1755	1830	75	3.75
Dead coral	1830	1840	10	0.5
Pontes	1840	1850	10	0.5
Dead coral	1850	1875	25	1.25
Pontes	1875	1885	10	0.5
Pocillopora	1885	1910	25	1.25
Acropora (branching)	1910	2000	90	4.5
Acropora (branching)	2000	2022	22	1.1
Totals			2000	100

II	intervals		(cm)	%cover
Platygyra	0	15	15	1.2
Fugia	15	30	15	1.2
Montipora	30	70	40	3.1
Porites	70	140	70	5.4
Pocillopora	140	170	30	2.3
Acropora (corymbose)	170	185	15	1.2
Dead coral	185	205	20	1.5
Acropora (corymbose)	205	206	1	0.1
Porites	206	320	114	8.8
Acropora (corymbose)	320	400	80	6.2
Dead coral	400	460	60	4.6
Porites	460	560	100	7.7
Dead coral	560	600	40	3.1
Sand	600	920	320	24.6
Porites	920	975	55	4.2
Platygyra	975	1000	25	1.9
Porites	1000	1080	80	6.2
Sand	1080	1245	165	12.7
Platygyra	1245	1275	30	2.3
Sand	1275	1290	15	1.2
Favites	1290	1295	5	0.4
Dead coral	1295	1300	5	0.4
Totals			1300	100

III	intervals		(cm)	%cover
Pontes	0	55	55	2.75
Sand	55	195	140	7
Pontes	195	330	135	6.75
Sand	330	770	440	22
Sponge (Neptune's cup)	770	840	70	3.5
Porites	840	700	-140	-7
Dead coral	700	740	40	2
Pontes	740	970	230	11.5
Dead coral	970	1090	120	6
Montipora	1090	1110	20	1
Pontes	1110	1340	230	11.5
Dead coral	1340	1360	20	1
Pontes	1360	1735	375	18.75
Pocillopora	1735	1750	15	0.75
Pontes	1750	1800	50	2.5
Acropora (corymbosus)	1800	1830	30	1.5
Pontes	1830	1910	80	4
Dead coral	1910	2000	90	4.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**5.86**
Porites component	**37.73**
Faviid coral component	**3.16**
Other living coral component	**9.19**
Other sessile organism component	**3.03**
Dead coral component	**14.68**
Abiotic component	**26.36**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**7.30**	**7.38**	**1.50**
Porites component	**30.10**	**32.23**	**50.70**
Faviid coral component	**3.96**	**5.77**	**0.00**
Other living coral component	**20.53**	**6.54**	**1.80**
Other sessile organism component	**5.50**	**0.00**	**3.50**
Dead coral component	**20.30**	**9.60**	**13.50**
Abiotic component	**12.36**	**38.50**	**29.00**
Totals	**100.00**	**100.00**	**100.00**

1997 Sampling
Sattahip Station 11
Kham Island

I	intervals		(cm)	%cover
Acropora (branching)	2000	1960	40	2
Dead coral	1960	1950	10	0.5
Fungia	1950	1940	10	0.5
Platygyra	1940	1910	30	1.5
Acropora (branching)	1910	1760	150	7.5
Acropora (corymbose)	1760	1730	30	1.5
Acropora (branching)	1730	1710	20	1
Dead coral	1710	1700	10	0.5
Acropora (branching)	1700	1640	60	3
Pocillopora	1640	1625	15	0.75
Acropora (branching)	1625	1605	20	1
Fungia	1605	1570	35	1.75
Fungia	1570	1555	15	0.75
Dead coral	1555	1525	30	1.5
Fungia	1525	1515	10	0.5
Fungia	1515	1495	20	1
Dead coral	1495	1475	20	1
Fungia	1475	1470	5	0.25
Fungia	1470	1455	15	0.75
Dead coral	1455	1440	15	0.75
Fungia	1440	1425	15	0.75
Dead coral	1425	1420	5	0.25
Fungia	1420	1410	10	0.5
Dead coral	1410	1390	20	1
Fungia	1390	1340	50	2.5
Dead coral	1340	1300	40	2
Fungia	1300	1240	60	3
Dead coral	1240	1179	61	3.05
Fungia	1179	1140	39	1.95
Dead coral	1140	1120	20	1
Acropora (branching)	1120	1095	25	1.25
Dead coral	1095	1040	55	2.75
Acropora (branching)	1040	1030	10	0.5
Dead coral	1030	980	50	2.5
Acropora (branching)	980	930	50	2.5
Dead coral	930	890	40	2
Acropora (branching)	890	885	5	0.25
Dead coral	885	870	15	0.75
Fungia	870	860	10	0.5
Dead coral	860	830	30	1.5
Acropora (branching)	830	800	30	1.5
Fungia	800	780	20	1
Acropora (branching)	780	745	35	1.75
Fungia	745	700	45	2.25
Dead coral	700	630	70	3.5
Pocillopora	630	620	10	0.5
Dead coral	620	290	330	16.5
Acropora	290	270	20	1
Dead coral	270	140	130	6.5
Acropora (branching)	140	100	40	2
Fungia	100	70	30	1.5
Dead coral	70	55	15	0.75
Fungia	55	40	15	0.75
Dead coral	40	10	30	1.5
Platygyra	10	0	10	0.5
Totals			2000	100

II	intervals		(cm)	%cover
Galaxea	0	10	10	0.5
Dead coral	10	595	585	29.25
Fungia	595	610	15	0.75
Dead coral	610	620	10	0.5
Favites	620	635	15	0.75
Fungia	635	640	5	0.25
Dead coral	640	650	10	0.5
Acropora (tabulate form)	650	710	60	3
Acropora (corymbose)	710	730	20	1
Acropora (tabulate form)	730	800	70	3.5
Acropora (branching)	800	820	20	1
Acropora (tabulate form)	820	840	20	1
Acropora (branching)	840	860	20	1
Acropora (tabulate form)	860	950	90	4.5
Acropora (branching)	950	1140	190	9.5
Dead coral	1140	1240	100	5
Galaxea	1240	1280	40	2
Acropora (corymbose)	1280	1310	30	1.5
Dead coral	1310	1370	60	3
Sea anemone	1370	1410	40	2
Dead coral	1410	1425	15	0.75
Sea anemone	1425	1455	30	1.5
Acropora (branching)	1455	1485	30	1.5
Sea anemone	1485	1510	25	1.25
Fungia	1510	1620	110	5.5
Acropora (corymbose)	1620	1635	15	0.75
Sea anemone	1635	1670	35	1.75
Dead coral	1670	1710	40	2
Acropora (branching)	1710	1725	15	0.75
Dead coral	1725	1790	65	3.25
Montipora	1790	1820	30	1.5
Dead coral	1820	1840	20	1
Acropora (branching)	1840	1860	20	1
Porites	1860	1880	20	1
Acropora (branching)	1880	1910	30	1.5
Dead coral	1910	1980	70	3.5
Acropora (branching)	1980	1990	10	0.5
Dead coral	1990	2000	10	0.5
Totals			2000	100

III	intervals		(cm)	%cover
Dead coral	0	75	75	3.75
Fungia	75	80	5	0.25
Dead coral	80	90	10	0.5
Fungia	90	100	10	0.5
Dead coral	100	150	50	2.5
Fungia	150	165	15	0.75
Dead coral	165	185	20	1
Fungia	185	195	10	0.5
Fungia	195	225	30	1.5
Fungia	225	235	10	0.5
Fungia	235	245	10	0.5
Dead coral	245	265	20	1
Fungia	265	305	40	2
Acropora (corymbose)	305	330	25	1.25
Dead coral	330	375	45	2.25
Pavona lata	375	390	15	0.75
Dead coral	390	530	140	7
Cyphastrea	530	550	20	1
Fungia	550	560	10	0.5
Dead coral	560	1110	550	27.5
Porites	1110	1130	20	1
Acropora (branching)	1130	1140	10	0.5
Acropora (tabulate form)	1140	1160	20	1
Porites	1160	1200	40	2
Dead coral	1200	1440	240	12
Acropora (branching)	1440	1445	5	0.25
Dead coral	1445	1460	15	0.75
Acropora (branching)	1460	1470	10	0.5
Dead coral	1470	1590	120	6
Acropora (branching)	1590	1615	25	1.25
Dead coral	1615	1700	85	4.25
Favia	1700	1710	10	0.5
Platygyra	1710	1740	30	1.5
Dead coral	1740	1780	40	2
Acropora (branching)	1780	1820	40	2
Dead coral	1820	1850	30	1.5
Acropora (branching)	1850	1870	20	1
Dead coral	1870	1960	90	4.5
Montipora	1960	2000	40	2
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**21.71**
Porites component	**1.45**
Faviid coral component	**1.87**
Other living coral component	**15.51**
Other sessile organism component	**2.17**
Dead coral component	**57.30**
Abiotic component	**0.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**25.75**	**32.00**	**7.38**
Porites component	**0.00**	**1.00**	**3.34**
Faviid coral component	**2.00**	**0.75**	**2.86**
Other living coral component	**22.45**	**10.50**	**13.57**
Other sessile organism component	**0.00**	**6.50**	**0.00**
Dead coral component	**49.80**	**49.25**	**72.86**
Abiotic component	**0.00**	**0.00**	**0.00**
Totals	**100.00**	**100.00**	**100.00**

1995 Sampling
Sattahip Station 12
Yoh Island

I	intervals		(cm)	%cover
Porites lutea	0	30	30	1.5
Porites lutea	30	40	10	0.5
Porites lutea	40	50	10	0.5
Platygyra	50	70	20	1
Encrusting sponge	70	110	40	2
Sand	110	140	30	1.5
Porites lutea	140	190	50	2.5
Acropora (tabulate)	190	330	140	7
Dead coral	330	345	15	0.75
Acropora (tabulate)	345	405	60	3
Acropora austera	405	420	15	0.75
Acropora (tabulate)	420	645	225	11.25
Acropora millipora	645	665	20	1
Acropora (tabulate)	665	685	20	1
Acropora (corymbose)	685	740	55	2.75
Acropora (corymbose)	740	780	40	2
Sand	780	790	10	0.5
Platygyra	790	810	20	1
Dead coral	810	820	10	0.5
Acropora (tabulate)	820	860	40	2
Goniastrea aspera	860	880	20	1
Acropora (tabulate)	880	895	15	0.75
Porites lutea	895	930	35	1.75
Sand	930	950	20	1
Favia sp	950	960	10	0.5
Montipora	960	970	10	0.5
Porites	970	1000	30	1.5
Acropora (tabulate)	1000	1160	160	8
Platygyra	1160	1200	40	2
Acropora (tabulate)	1200	1245	45	2.25
Sea anemone	1245	1270	25	1.25
Acropora (tabulate)	1270	1305	35	1.75
Acropora (branching)	1305	1320	15	0.75
Acropora (tabulate)	1320	1390	70	3.5
Acropora (branching)	1390	1770	380	19
Porites lutea	1770	1820	50	2.5
Montipora tuberculosa	1820	1835	15	0.75
Sand	1835	1855	20	1
Acropora (tabulate)	1855	2000	145	7.25
Totals			2000	100

II	intervals		(cm)	%cover
Acropora (tabulate)	2500	2545	45	2.25
Dead coral	2545	2580	35	1.75
Acropora (branching)	2580	2595	15	0.75
Platygyra	2595	2655	60	3
Dead coral	2655	2675	20	1
Acropora (branching)	2675	2690	15	0.75
Dead coral	2690	2725	35	1.75
Platygyra	2725	2735	10	0.5
Dead coral	2735	2760	25	1.25
Platygyra	2760	2800	40	2
Acropora (branching)	2800	2840	40	2
Acropora (tabulate)	2840	2880	40	2
Acropora (branching)	2880	3150	270	13.5
Acropora (tabulate)	3150	3490	340	17
Platygyra	3490	3550	60	3
Sand	3550	3570	20	1
Acropora (tabulate)	3570	3770	200	10
Acropora (branching)	3770	3820	50	2.5
Acropora (tabulate)	3820	3935	115	5.75
Montipora	3935	3955	20	1
Dead coral	3955	4000	45	2.25
Platygyra	4000	4035	35	1.75
Dead coral	4035	4090	55	2.75
Fungia	4090	4105	15	0.75
Dead coral	4105	4215	110	5.5
Pavona	4215	4235	20	1
Dead coral	4235	4280	45	2.25
Fungia	4280	4290	10	0.5
Dead coral	4290	4330	40	2
Fungia	4330	4340	10	0.5
Acropora (branching)	4340	4500	160	8
Totals			2000	100

III	intervals		(cm)	%cover
Acropora (tabulate)	0	10	10	0.5
Acropora aspera	10	40	30	4
Acropora (tabulate)	90	130	90	4.5
Platygyra	130	220	40	2
Acropora (tabulate)	220	280	60	3
Acropora (branching)	280	310	30	1.5
Dead coral	310	330	20	1
Acropora (tabulate)	330	340	10	0.5
Acropora (branching)	340	380	40	2
Dead coral	380	410	30	1.5
Platygyra	410	450	40	2
Dead coral	450	540	90	4.5
Acropora (tabulate)	540	700	160	8
Acropora florida	700	770	70	3.5
Dead coral	770	790	20	1
Acropora (tabulate)	790	930	140	7
Acropora (branching)	930	960	30	1.5
Acropora (tabulate)	960	1260	300	15
Dead coral	1260	1280	20	1
Platygyra	1280	1340	60	3
Porites	1340	1360	20	1
Goniastrea	1360	1375	15	0.75
Acropora (tabulate)	1375	1770	395	19.75
Porites	1770	1830	60	3
Sand	1830	1850	20	1
Acropora (branching)	1850	1950	100	5
Dead coral	1950	2000	50	2.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**71.42**
Porites component	**4.92**
Faviid coral component	**7.83**
Other living coral component	**1.67**
Other sessile organism component	**1.08**
Dead coral component	**11.08**
Abiotic component	**2.00**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**74.00**	**64.50**	**75.75**
Porites component	**10.75**	**0.00**	**4.00**
Faviid coral component	**5.50**	**10.25**	**7.75**
Other living coral component	**1.25**	**3.75**	**0.00**
Other sessile organism component	**3.25**	**0.00**	**0.00**
Dead coral component	**1.25**	**20.50**	**11.50**
Abiotic component	**4.00**	**1.00**	**1.00**
Totals	**100.00**	**100.00**	**100.00**

1997 Sampling
Sattahip Station 13
Samaesan Island

I	intervals		(cm)	%cover
Platygyra	2000	1970	30	1.5
Dead coral	1970	1930	40	2
Goniastrea	1930	1925	5	0.25
Sand	1925	1920	5	0.25
Favites	1920	1910	10	0.5
Porites	1910	1395	15	0.75
Dead coral	1395	1370	25	1.25
Favites	1370	1345	25	1.25
Porites	1345	1825	20	1
Goniastrea	1325	1315	10	0.5
Dead coral	1315	1775	40	2
Goniastrea	1775	1770	5	0.25
Porites lutea	1770	1750	20	1
Dead coral	1750	1640	110	5.5
Goniastrea	1640	1635	5	0.25
Dead coral	1635	1625	10	0.5
Goniastrea	1625	1615	10	0.5
Dead coral	1615	1560	55	2.75
Favia	1560	1540	20	1
Dead coral	1540	1520	20	1
Porites	1520	1470	50	2.5
Dead coral	1470	1445	25	1.25
Platygyra	1445	1435	10	0.5
Sand	1435	1395	40	2
Platygyra	1395	1380	15	0.75
Dead coral	1380	1220	160	8
Porites	1220	1195	25	1.25
Sand	1195	1145	50	2.5
Platygyra	1145	1135	10	0.5
Favia	1135	1120	15	0.75
Sand	1120	1080	40	2
Favia	1080	1070	10	0.5
Dead coral	1070	920	150	7.5
Porites	920	900	20	1
Dead coral	900	875	25	1.25
Platygyra	375	373	2	0.1
Porites	373	365	8	0.4
Dead coral	365	350	15	0.75
Porites	350	335	15	0.75
Sand	335	710	125	6.25
Goniastrea	710	690	20	1
Dead coral	690	675	15	0.75
Goniastrea	675	670	5	0.25
Sand	670	580	90	4.5
Dead coral	580	550	30	1.5
Goniastrea	550	520	30	1.5
Dead coral	520	480	40	2
Goniastrea	480	470	10	0.5
Sand	470	435	35	1.75
Favia	435	380	55	2.75
Sand	380	220	160	8
Dead coral	220	175	45	2.25
Platygyra	175	165	10	0.5
Dead coral	165	140	25	1.25
Goniastrea	140	115	25	1.25
Dead coral	115	100	15	0.75
Favites	100	30	70	3.5
Porites	30	0	30	1.5
Totals			2000	100

II	intervals		(cm)	%cover
Porites	0	40	40	2
Dead coral	40	100	60	3
Sand	100	170	70	3.5
Dead coral	170	200	30	1.5
Sand	200	310	110	5.5
Dead coral	310	420	110	5.5
Favia	420	430	10	0.5
Dead coral	430	510	80	4
Porites	510	530	20	1
Dead coral	530	590	60	3
Sand	590	620	30	1.5
Dead coral	620	700	80	4
Porites	700	760	60	3
Sand	760	800	40	2
Dead coral	800	850	50	2.5
Porites	850	890	40	2
Sand	890	905	15	0.75
Platygyra	905	920	15	0.75
Dead coral	920	1020	100	5
Platygyra	1020	1040	20	1
Montipora	1040	1070	30	1.5
Dead coral	1070	1125	55	2.75
Platygyra	1125	1145	20	1
Sand	1145	1155	10	0.5
Goniastrea	1155	1165	10	0.5
Dead coral	1165	1200	35	1.75
Goniastrea	1200	1210	10	0.5
Dead coral	1210	1215	5	0.25
Platygyra	1215	1220	5	0.25
Goniastrea	1220	1235	15	0.75
Porites	1235	1260	25	1.25
Goniastrea	1260	1280	20	1
Dead coral	1280	1320	40	2
Galaxea	1320	1330	10	0.5
Dead coral	1330	1410	80	4
Porites	1410	1435	25	1.25
Dead coral	1435	1485	50	2.5
Favites	1485	1565	80	4
Dead coral	1565	1585	20	1
Goniastrea	1585	1600	15	0.75
Dead coral	1600	1645	45	2.25
Goniastrea	1645	1655	10	0.5
Sand	1655	1670	15	0.75
Porites	1670	1710	40	2
Sand	1710	1730	20	1
Porites	1730	1770	40	2
Sand	1770	1800	30	1.5
Porites	1800	1820	20	1
Dead coral	1820	1890	70	3.5
Porites	1890	1920	30	1.5
Dead coral	1920	2000	80	4
Totals			2000	100

III	intervals		(cm)	%cover
Goniastrea	0	20	20	1
Sand	20	35	15	0.75
Porites	35	50	15	0.75
Sand	50	80	30	1.5
Favites	80	125	45	2.25
Sand	125	200	75	3.75
Dead coral	200	220	20	1
Favites	220	260	40	2
Dead coral	260	410	150	7.5
Sand	410	440	30	1.5
Dead coral	440	470	30	1.5
Sand	470	500	30	1.5
Dead coral	500	630	130	6.5
Porites	630	720	90	4.5
Dead coral	720	1150	430	21.5
Porites lutea	1150	1130	30	1.5
Dead coral	1130	1285	105	5.25
Platygyra	1285	1305	20	1
Dead coral	1305	1455	150	7.5
Platygyra	1455	1460	5	0.25
Dead coral	1460	1500	40	2
Platygyra	1500	1510	10	0.5
Dead coral	1510	1550	40	2
Platygyra	1550	1560	10	0.5
Porites	1560	1570	10	0.5
Goniastrea	1570	1600	30	1.5
Dead coral	1600	1620	20	1
Porites	1620	1650	30	1.5
Galaxea	1650	1660	10	0.5
Dead coral	1660	1950	290	14.5
Favites	1950	1970	20	1
Porites	1970	2000	30	1.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.00**
Porites component	**12.42**
Faviid coral component	**14.01**
Other living coral component	**0.83**
Other sessile organism component	**0.00**
Dead coral component	**55.12**
Abiotic component	**17.62**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**0.00**	**0.00**	**0.00**
Porites component	**10.00**	**17.00**	**10.25**
Faviid coral component	**20.54**	**11.50**	**10.00**
Other living coral component	**0.00**	**2.00**	**0.50**
Other sessile organism component	**0.00**	**0.00**	**0.00**
Dead coral component	**42.61**	**52.50**	**70.25**
Abiotic component	**26.85**	**17.00**	**9.00**
Totals	**100.00**	**100.00**	**100.00**

1997 Sampling
Sattahip Station 14
Rat Island

I	intervals		(cm)	%cover
Porites	0	20	20	1
Dead coral	20	50	30	1.5
Porites	50	65	15	0.75
Pocillopora	65	90	25	1.25
Porites	90	100	10	0.5
Dead coral	100	135	35	4.25
Porites	135	200	15	0.75
Porites	200	230	30	1.5
Dead coral	230	280	50	2.5
Dead coral	280	335	55	2.75
Platygyra	335	345	10	0.5
Acropora (corymbose)	345	380	35	1.75
Dead coral	380	420	40	2
Porites	420	450	30	1.5
Dead coral	450	480	30	1.5
Porites	480	500	20	1
Dead coral	500	510	10	0.5
Porites	510	540	30	1.5
Dead coral	540	560	20	1
Porites	560	590	30	1.5
Montipora	590	630	40	2
Pocillopora	630	640	10	0.5
Montipora	640	700	60	3
Porites	700	720	20	1
Sand	720	840	120	6
Dead coral	840	920	80	4
Pocillopora	920	930	10	0.5
Dead coral	930	955	25	1.25
Porites	955	1150	195	9.75
Galaxea	1150	1165	15	0.75
Dead coral	1165	1180	15	0.75
Pocillopora	1180	1190	10	0.5
Porites	1190	1210	20	1
Porites	1210	1240	30	1.5
Dead coral	1240	1270	30	1.5
Porites	1270	1320	50	2.5
Acropora (corymbose)	1320	1405	85	4.25
Dead coral	1405	1430	25	1.25
Porites	1430	1450	20	1
Pocillopora	1450	1465	15	0.75
Porites	1465	1595	130	6.5
Sand	1595	1610	15	0.75
Porites	1610	1665	55	2.75
Porites	1665	1730	65	3.25
Porites	1730	1750	20	1
Dead coral	1750	1855	105	5.25
Porites	1855	1910	55	2.75
Montipora	1910	2000	90	4.5
Totals			2000	100

II	intervals		(cm)	%cover
Montipora	2000	2015	15	0.75
Dead coral	2015	2050	35	1.75
Porites	2050	2060	10	0.5
Dead coral	2060	2080	20	1
Dead coral	2080	2130	50	2.5
Porites	2130	2170	40	2
Porites	2170	2200	30	1.5
Dead coral	2200	2230	30	1.5
Porites	2230	2280	50	2.5
Dead coral	2280	2440	160	3
Porites	2440	2510	70	3.5
Sand	2510	2540	30	1.5
Porites	2540	2560	20	1
Dead coral	2560	2580	20	1
Pocillopora	2580	2600	20	1
Dead coral	2600	2670	70	3.5
Porites	2670	2685	15	0.75
Dead coral	2685	2735	50	2.5
Porites	2735	2760	25	1.25
Dead coral	2760	2775	15	0.75
Porites	2775	2810	35	1.75
Dead coral	2810	2900	90	4.5
Galaxea	2900	2910	10	0.5
Dead coral	2910	2950	40	2
Porites	2950	2958	3	0.4
Pavona	2958	3000	42	2.1
Pavona	3000	3020	20	1
Porites	3020	3035	15	0.75
Dead coral	3035	3060	25	1.25
Montipora	3060	3210	150	7.5
Dead coral	3210	3240	30	1.5
Porites	3240	3280	40	2
Dead coral	3280	3320	40	2
Porites	3320	3340	20	1
Dead coral	3340	3355	15	0.75
Porites	3355	3375	20	1
Dead coral	3375	3400	25	1.25
Porites	3400	3450	50	2.5
Dead coral	3450	3460	10	0.5
Porites	3460	3490	30	1.5
Dead coral	3490	3620	130	6.5
Porites	3620	3640	20	1
Dead coral	3640	3650	10	0.5
Porites	3650	3680	30	1.5
Dead coral	3680	3700	20	1
Porites	3700	3710	10	0.5
Porites	3710	3725	15	0.75
Dead coral	3725	3770	45	2.25
Porites	3770	3780	10	0.5
Porites	3780	3840	60	3
Dead coral	3840	3900	60	3
Porites	3900	3935	35	1.75
Dead coral	3935	3960	25	1.25
Porites	3960	4000	40	2
Totals			2000	100

III	intervals		(cm)	%cover
Dead coral	0	70	70	3.5
Porites	70	85	15	0.75
Dead coral	85	90	5	0.25
Porites	90	110	20	1
Dead coral	110	155	45	2.25
Porites	155	170	15	0.75
Dead coral	170	210	40	2
Porites	210	235	25	1.25
Dead coral	235	280	45	2.25
Porites	280	330	50	2.5
Sand	330	430	100	5
Porites	430	490	60	3
Sand	490	820	330	16.5
Porites	820	845	25	1.25
Sand	845	860	15	0.75
Pavona	860	900	40	2
Dead coral	900	990	90	4.5
Porites	990	1005	15	0.75
Dead coral	1005	1020	15	0.75
Porites	1020	1035	15	0.75
Dead coral	1035	1070	35	1.75
Porites	1070	1080	10	0.5
Dead coral	1080	1120	40	2
Porites	1120	1130	10	0.5
Dead coral	1130	1165	35	1.75
Porites	1165	1200	35	1.75
Porites	1200	1240	40	2
Dead coral	1240	1250	10	0.5
Porites	1250	1280	30	1.5
Porites	1280	1300	20	1
Dead coral	1300	1330	30	1.5
Porites	1330	1350	20	1
Dead coral	1350	1365	15	0.75
Porites	1365	1400	35	1.75
Dead coral	1400	1410	10	0.5
Porites	1410	1430	20	1
Favia	1430	1440	10	0.5
Porites	1440	1510	70	3.5
Dead coral	1510	1590	80	4
Porites	1590	1620	30	1.5
Dead coral	1620	1670	50	2.5
Porites	1670	1710	40	2
Sand	1710	1780	70	3.5
Acropora (corymbose)	1780	1820	40	2
Sand	1820	1905	85	4.25
Favites	1905	1920	15	0.75
Sand	1920	1930	10	0.5
Porites	1930	2000	70	3.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	2.67
Porites component	37.13
Faviid coral component	0.58
Other living coral component	9.53
Other sessile organism component	0.00
Dead coral component	37.17
Abiotic component	12.92
Totals	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	6.00	0.00	2.00
Porites component	43.00	34.90	33.50
Faviid coral component	0.50	0.00	1.25
Other living coral component	13.75	12.85	2.00
Other sessile organism component	0.00	0.00	0.00
Dead coral component	30.00	50.75	30.75
Abiotic component	6.75	1.50	30.50
Totals	100.00	100.00	100.00

1998 Sampling

1998 Sampling
Sichang Station 15
Tai Tamun Island

I	intervals		(cm)	%cover
Porites	0	45	45	2.25
Dead coral	45	180	135	6.75
Porites	180	200	20	1
Dead coral	200	270	70	3.5
Porites	270	305	35	1.75
Dead coral	305	340	35	1.75
Porites	340	450	110	5.5
Porites	450	470	20	1
Dead coral	470	500	30	1.5
Dead coral	500	540	40	2
Porites	540	595	55	2.75
Symphyllia	595	600	5	0.25
Porites	600	640	40	2
Dead coral	640	685	45	2.25
Porites	685	700	15	0.75
Favia favus	700	730	30	1.5
Zooanthid	730	750	20	1
Porites	750	770	20	1
Sand	770	800	30	1.5
Porites	800	815	15	0.75
Dead coral	815	840	25	1.25
Porites	840	860	20	1
Porites	860	930	70	3.5
Dead coral	930	940	10	0.5
Porites	940	1000	60	3
Montipora	4000	4010	10	0.5
Porites	4010	4020	10	0.5
Dead coral	4020	4170	150	7.5
Porites	4170	4200	30	1.5
Dead coral	4200	4370	170	8.5
Porites	4370	4465	95	4.75
Dead coral	4465	4500	35	1.75
Porites	4500	4580	80	4
Dead coral	4580	4710	130	6.5
Porites	4710	4750	40	2
Dead coral	4750	4770	20	1
Montipora	4770	4780	10	0.5
Pocillopora	4780	4800	20	1
Dead coral	4800	4840	40	2
Porites	4840	4910	70	3.5
Dead coral	4910	5000	90	4.5
Totals			2000	100

II	intervals		(cm)	%cover
Zooanthid	2000	2065	65	3.25
Sand	2065	2080	15	0.75
Zooanthid	2080	2100	20	1
Platygyra	2100	2120	20	1
Porites	2120	2130	10	0.5
Pocillopora	2130	2140	10	0.5
Porites	2140	2210	70	3.5
Porites	2210	2320	110	5.5
Dead coral	2320	2350	30	1.5
Porites	2350	2430	80	4
Porites	2430	2580	150	7.5
Sand	2580	2600	20	1
Porites	2600	2680	80	4
Dead coral	2630	2710	30	1.5
Dead coral	2710	2740	30	1.5
Porites	2740	2800	60	3
Dead coral	2800	2830	30	1.5
Porites	2830	2850	20	1
Lithophagus	2850	2855	5	0.25
Porites	2855	2865	10	0.5
Lithophagus	2865	2875	10	0.5
Porites	2875	2950	75	3.75
Dead coral	2950	2965	15	0.75
Porites	2965	2985	20	1
Dead coral	2985	3025	40	2
Goniopora	3025	3300	275	13.75
Dead coral	3300	3330	30	1.5
Pavona	3330	3350	20	1
Goniopora	3350	3365	15	0.75
Dead coral	3365	3385	20	1
Lithophyllon	3385	3410	25	1.25
Pavona	3410	3415	5	0.25
Dead coral	3415	3430	15	0.75
Goniopora	3430	3450	20	1
Porites	3450	3470	20	1
Dead coral	3470	3475	5	0.25
Pavona	3475	3490	15	0.75
Porites	3490	3570	80	4
Pavona	3570	3600	30	1.5
Porites	3600	3690	90	4.5
Dead coral	3690	3735	45	2.25
Platygyra	3735	3755	20	1
Porites	3755	3790	35	1.75
Zooanthid	3790	3830	40	2
Dead coral	3830	3860	30	1.5
Symphyllia	3860	3890	30	1.5
Goniastrea	3890	3920	30	1.5
Pocillopora	3920	3930	10	0.5
Montipora	3930	4000	70	3.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	25	25	1.25
Sand	25	150	125	6.25
Dead coral	150	185	35	1.75
Porites	185	220	35	1.75
Sand	220	270	50	2.5
Pocillopora	270	280	10	0.5
Porites	280	320	40	2
Dead coral	320	340	20	1
Zooanthid	340	360	20	1
Sand	360	380	20	1
Pavona	380	395	15	0.75
Rock	395	410	15	0.75
Rock	410	445	35	1.75
Goniastrea	445	460	15	0.75
Rock	460	490	30	1.5
Porites	490	510	20	1
Dead coral	510	550	40	2
Porites	550	555	5	0.25
Dead coral	555	565	10	0.5
Porites	565	575	10	0.5
Sand	575	585	10	0.5
Symphyllia	585	650	65	3.25
Rock	650	675	25	1.25
Symphyllia	675	720	45	2.25
Porites	720	750	30	1.5
Sand	750	800	50	2.5
Dead coral	800	820	20	1
Rock	820	840	20	1
Dead coral	840	870	30	1.5
Pocillopora	870	900	30	1.5
Dead coral	900	940	40	2
Pavona	940	980	40	2
Dead coral	980	1015	35	1.75
Porites	1015	1060	45	2.25
Pavona	1060	1120	60	3
Sand	1120	1270	150	7.5
Pavona	1270	1300	30	1.5
Porites	1300	1310	10	0.5
Rock	1310	1315	5	0.25
Favites	1315	1340	25	1.25
Pocillopora	1340	1345	5	0.25
Sand	1345	1350	5	0.25
Pocillopora	1350	1360	10	0.5
Porites	1360	1415	55	2.75
Sand	1415	1465	50	2.5
Porites	1465	1560	95	4.75
Pocillopora	1560	1570	10	0.5
Sand	1570	1600	30	1.5
Porites	1600	1670	70	3.5
Symphyllia	1670	1700	30	1.5
Porites	1700	1720	20	1
Pocillopora	1720	1725	5	0.25
Porites	1725	1740	15	0.75
Dead coral	1740	1750	10	0.5
Porites	1750	1830	80	4
Dead coral	1830	1845	15	0.75
Porites	1845	1960	115	5.75
Sand	1960	1990	30	1.5
Encrusting Tunicate	1990	2000	10	0.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	0.00
Porites component	40.50
Faviid coral component	2.37
Other living coral component	15.83
Other sessile organism componen	3.17
Dead coral component	26.67
Abiotic component	11.92
Total	100.00

Percent area coverage of major reef components on each 20 meter transect

	I	II	III
Acropora component	0.00	0.00	##
Porites component	42.50	45.50	##
Faviid coral component	1.50	3.50	##
Other living coral component	2.25	27.50	##
Other sessile organism componen	1.00	7.00	##
Dead coral component	51.25	16.00	##
Abiotic component	1.50	1.75	##
Totals	100.00	100.00	##

1998 Sampling
Sichang Station 2
East-Sichang Island

I	intervals		(cm)	%cover
Rock	2000	1910	90	4.5
Dead coral Debris	1910	1790	120	6
Porites	1790	1680	110	5.5
Dead coral Debris	1680	1670	10	0.5
Porites	1670	1620	50	2.5
Encrusting sponge	1620	1595	25	1.25
Porites	1595	1455	140	7
Rock	1455	1280	175	8.75
Palythoa	1280	1220	60	3
Acropora (branching)	1220	1100	120	6
Dead coral	1100	1040	60	3
Acropora (branching)	1040	990	50	2.5
Dead coral	990	945	45	2.25
Acropora (branching)	945	845	100	5
Rock	845	830	15	0.75
Palythoa	830	820	10	0.5
Porites	820	780	40	2
Dead coral debris	780	760	20	1
Favia	760	755	5	0.25
Dead coral debris	755	730	25	1.25
Porites	730	670	60	3
Rock	670	570	100	5
Porites	570	555	15	0.75
Palythoa	555	520	35	1.75
Favia favus	520	480	40	2
Porites	480	160	320	16
Palythoa	160	110	50	2.5
Dead coral	110	70	40	2
Porites	70	0	70	3.5
Totals			2000	100

II	intervals		(cm)	%cover
Dead coral debris	0	35	35	1.75
Encrusting sponge (Blue)	35	45	10	0.5
Palythoa	45	50	5	0.25
Platygyra	50	80	30	1.5
Palythoa	80	380	300	15
Rock	380	590	210	10.5
Palythoa	590	640	50	2.5
Encrusting sponge (Blue)	640	650	10	0.5
Palythoa	650	900	250	12.5
Dead coral debris	900	990	90	4.5
Palythoa	990	1070	80	4
Sand	1070	1130	60	3
Palythoa	1130	1175	45	2.25
Dead coral debris	1175	1420	245	12.25
Palythoa	1420	1440	20	1
Rock	1440	1480	40	2
Palythoa	1480	1520	40	2
Rock	1520	1550	30	1.5
Porites	1550	1710	160	8
Rock	1710	1750	40	2
Porites	1750	1860	110	5.5
Palythoa	1860	1930	70	3.5
Palythoa	1930	2000	70	3.5
Totals			2000	100

Percent area coverage of major reef components relative to 40 meter long transect

	(%)
Acropora component	**6.75**
Porites component	**26.88**
Faviid coral component	**1.88**
Other living coral component	**0.00**
Other sessile organism component	**28.25**
Dead coral component	**17.25**
Abiotic component	**19.00**
Total	**100.00**

Percent area coverage of major reef components on each 20 meter transect

	I	II
Acropora component	**13.50**	**0.00**
Porites component	**40.25**	**13.50**
Faviid coral component	**2.25**	**1.50**
Other living coral component	**0.00**	**0.00**
Other sessile organism component	**9.00**	**47.50**
Dead coral component	**16.00**	**18.50**
Abiotic component	**19.00**	**19.00**
Totals	**100.00**	**100.00**

1998 Sampling
Sichang Station 3
West-Sichang Island

I	intervals		(cm)	%cover
Porites	2000	2060	60	3
Porites	2060	2105	45	2.25
Porites	2105	2135	30	1.5
Porites	2135	2155	20	1
Platygyra	2155	2170	15	0.75
Porites	2170	2185	15	0.75
Platygyra	2185	2205	20	1
Porites	2205	2235	30	1.5
Rock	2235	2290	55	2.75
Favites	2290	2300	10	0.5
Rock	2300	2315	15	0.75
Porites	2315	2340	25	1.25
Rock	2340	2350	10	0.5
Porites	2350	2380	30	1.5
Rock	2380	2415	35	1.75
Porites	2415	2440	25	1.25
Pocillopora	2440	2480	40	2
Rock	2480	2500	20	1
Platygyra	2500	2510	10	0.5
Rock	2510	2520	10	0.5
Porites	2520	2560	40	2
Rock	2560	2620	60	3
Pocillopora	2620	2640	20	1
Porites	2640	2660	20	1
Rock	2660	2680	20	1
Porites	2680	2690	10	0.5
Rock	2690	2700	10	0.5
Porites	2700	2720	20	1
Rock	2720	2740	20	1
Platygyra	2740	2745	5	0.25
Platygyra	2745	2765	20	1
Platygyra	2765	2780	15	0.75
Rock	2780	2785	5	0.25
Platygyra	2785	2800	15	0.75
Porites	2800	2820	20	1
Platygyra	2820	2830	10	0.5
Rock	2830	2850	20	1
Porites	2850	2975	125	6.25
Porites	2975	3005	30	1.5
Favia	3005	3020	15	0.75
Rock	3020	3040	20	1
Sea anemone	3040	3080	40	2
Dead coral	3080	3100	20	1
Rock	3100	3125	25	1.25
Favia	3125	3135	10	0.5
Rock	3135	3160	25	1.25
Favia	3160	3170	10	0.5
Rock	3170	3180	10	0.5
Platygyra	3180	3195	15	0.75
Porites	3195	3205	10	0.5
Porites	3205	3230	25	1.25
Goniopora	3230	3255	25	1.25
Rock	3255	3320	65	3.25
Porites	3320	3330	10	0.5
Rock	3330	3345	15	0.75
Pocillopora	3345	3355	10	0.5
Porites	3355	3360	5	0.25
Rock	3360	3365	5	0.25
Porites	3365	3380	15	0.75
Rock	3380	3430	50	2.5
Symphyllia	3430	3450	20	1
Rock	3450	3460	10	0.5
Porites	3460	3490	30	1.5
Favites	3490	3500	10	0.5
Rock	3500	3530	30	1.5
Porites	3530	3540	10	0.5
Porites	3540	3550	10	0.5
Dead coral	3550	3570	20	1
Rock	3570	3665	95	4.75
Platygyra	3665	3730	65	3.25
Rock	3730	3770	40	2
Porites	3770	3800	30	1.5
Dead coral	3800	3920	120	6
Rock	3920	4000	80	4
Totals			2000	100

II	intervals		(cm)	%cover
Porites	0	20	20	1
Porites	20	50	30	1.5
Dead coral	50	90	40	2
Porites	90	130	40	2
Rock	130	160	30	1.5
Porites	160	190	30	1.5
Porites	190	250	60	3
Porites	250	270	20	1
Rock	270	330	60	3
Porites	330	355	25	1.25
Porites	355	460	105	5.25
Rock	460	490	30	1.5
Porites	490	635	145	7.25
Rock	635	650	15	0.75
Favia	650	660	10	0.5
Rock	660	695	35	1.75
Porites	695	740	45	2.25
Rock	740	775	35	1.75
Platygyra	775	815	40	2
Rock	815	890	75	3.75
Pocillopora	890	900	10	0.5
Porites	900	980	80	4
Platygyra	980	1020	40	2
Porites	1020	1070	50	2.5
Platygyra	1070	1080	10	0.5
Porites	1080	1100	20	1
Rock	1100	1120	20	1
Porites	1120	1125	5	0.25
Dead coral	1125	1135	10	0.5
Porites	1135	1170	35	1.75
Porites	1170	1180	10	0.5
Rock	1180	1300	120	6
Porites	1300	1310	10	0.5
Dead coral	1310	1385	75	3.75
Porites	1385	1545	160	8
Porites	1545	1580	35	1.75
Rock	1580	1710	130	6.5
Porites	1710	1730	20	1
Platygyra	1730	1740	10	0.5
Rock	1740	1750	10	0.5
Pocillopora	1750	1760	10	0.5
Dead coral	1760	1770	10	0.5
Psamocora	1770	1780	10	0.5
Favia	1780	1790	10	0.5
Rock	1790	1820	30	1.5
Symphyllia	1820	1845	25	1.25
Galaxea	1845	1920	75	3.75
Porites	1920	1935	15	0.75
Dead coral	1935	1950	15	0.75
Platygyra	1950	1970	20	1
Porites	1970	2000	30	1.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	55	55	2.75
Rock	55	150	95	4.75
Porites	150	220	70	3.5
Palythoa	220	240	20	1
Porites	240	270	30	1.5
Dead coral	270	295	25	1.25
Porites	295	325	30	1.5
Dead coral	325	380	55	2.75
Platygyra	380	390	10	0.5
Dead coral	390	400	10	0.5
Symphyllia	400	410	10	0.5
Goniastrea	410	420	10	0.5
Porites	420	475	55	2.75
Rock	475	580	105	5.25
Porites	580	600	20	1
Rock	600	610	10	0.5
Porites	610	645	35	1.75
Rock	645	680	35	1.75
Porites	680	705	25	1.25
Rock	705	810	105	5.25
Porites	810	920	110	5.5
Porites	920	940	20	1
Favites	940	950	10	0.5
Turbinaria	950	995	45	2.25
Porites	995	1010	15	0.75
Rock	1010	1025	15	0.75
Porites	1025	1060	35	1.75
Dead coral	1060	1085	25	1.25
Porites	1085	1110	25	1.25
Rock	1110	1250	140	7
Goniastrea	1250	1260	10	0.5
Rock	1260	1270	10	0.5
Porites	1270	1310	40	2
Porites	1310	1370	60	3
Rock	1370	1420	50	2.5
Dead coral	1420	1485	65	3.25
Porites	1485	1570	85	4.25
Dead coral	1570	1600	30	1.5
Porites	1600	1620	20	1
Favia	1620	1630	10	0.5
Rock	1630	1670	40	2
Porites	1670	1860	190	9.5
Sand	1860	1880	20	1
Porites	1880	1920	40	2
Platygyra	1920	1930	10	0.5
Porites	1930	2000	70	3.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.00**
Porites component	**44.83**
Faviid coral component	**6.88**
Other living coral component	**5.19**
Other sessile organism component	**0.91**
Dead coral component	**10.78**
Abiotic component	**31.41**
Total	**100.00**

Percent area coverage of major reef components on each 20 meter transect

	I	II	III
Acropora component	**0.00**	**0.00**	**0.00**
Porites component	**33.48**	**49.50**	**51.50**
Faviid coral component	**10.65**	**7.00**	**3.00**
Other living coral component	**6.31**	**6.50**	**2.75**
Other sessile organism component	**1.74**	**0.00**	**1.00**
Dead coral component	**14.35**	**7.50**	**10.50**
Abiotic component	**33.48**	**29.50**	**31.25**
Totals	**100.00**	**100.00**	**100.00**

1998 Sampling
Sichang Station 4
Sampanju Island

	intervals		(cm)	%cover
Porites	0	20	20	1
Rock	20	80	60	3
Porites	80	120	40	2
Dead coral	120	140	20	1
Pavona	140	150	10	0.5
Porites	150	160	10	0.5
Dead coral	160	220	60	3
Porites	220	280	60	3
Rock	280	320	40	2
Favia	320	330	10	0.5
Porites	330	470	140	7
Porites	470	510	40	2
Porites	510	550	40	2
Platygyra	550	580	30	1.5
Porites	580	650	70	3.5
Porites	650	760	110	5.5
Porites	760	850	90	4.5
Porites	850	940	90	4.5
Porites	940	1010	70	3.5
Turbinaria e	1010	1045	35	1.75
Dead coral	1045	1090	45	2.25
Porites	1090	1105	15	0.75
Dead coral	1105	1120	15	0.75
Porites	1120	1140	20	1
Dead coral	1140	1170	30	1.5
Porites	1170	1315	145	7.25
Porites	1315	1340	25	1.25
Porites	1340	1395	55	2.75
Dead coral	1395	1420	25	1.25
Porites	1420	1480	60	3
Porites	1480	1520	40	2
Platygyra	1520	1550	30	1.5
Dead coral	1550	1600	50	2.5
Porites	1600	1700	100	5
Dead coral debris	1700	1710	10	0.5
Porites	1710	1780	70	3.5
Rock/Sand	1780	1980	200	10
Porites	1980	2000	20	1
Totals			2000	100

Percent area coverage of major reef components relative to 20 meter long transect

	(%)
Acropora component	**0.00**
Porites component	**65.75**
Faviid coral component	**3.50**
Other living coral component	**2.25**
Other sessile organism component	**0.00**
Dead coral component	**12.75**
Abiotic component	**15.75**

1998 Sampling
Sichang Station 5
Lan Dokmai Island

I	intervals		(cm)	%cover
Porites	0	45	45	2.25
Porites	45	70	25	1.25
Symphyllia	70	110	40	2
Palythoa	110	130	20	1
Porites	130	170	40	2
Rock	170	210	40	2
Porites	210	270	60	3
Rock	270	290	20	1
Favites	290	300	10	0.5
Rubble	300	410	110	5.5
Porites	410	510	100	5
Rock	510	520	10	0.5
Porites	520	600	80	4
Rubble	600	670	70	3.5
Goniopora	670	700	30	1.5
Rubble	700	830	130	6.5
Favia	830	845	15	0.75
Porites	845	870	25	1.25
Rubble	870	945	75	3.75
Dead coral	945	960	15	0.75
Rubble	960	1080	120	6
Porites	1080	1140	60	3
Rubble	1140	1210	70	3.5
Porites	1210	1250	40	2
Rubble	1250	1360	110	5.5
Symphyllia	1360	1390	30	1.5
Favia	1390	1410	20	1
Symphyllia	1410	1420	10	0.5
Porites	1420	1470	50	2.5
Rubble	1470	1490	20	1
Favia	1490	1500	10	0.5
Porites	1500	1580	80	4
Rubble	1580	1640	60	3
Porites	1640	1730	90	4.5
Rubble	1730	1850	120	6
Porites	1850	1880	30	1.5
Sand	1880	1910	30	1.5
Palythoa	1910	1940	30	1.5
Porites	1940	1980	40	2
Favia	1980	2000	20	1
Totals			2000	100

II	intervals		(cm)	%cover
Porites	0	20	20	1
Rock	20	70	50	2.5
Porites	70	400	330	16.5
Favia	400	430	30	1.5
Porites	430	570	140	7
Dead coral	570	610	40	2
Porites	610	760	150	7.5
Porites	760	800	40	2
Porites	800	880	80	4
Porites	880	905	25	1.25
Porites	905	960	55	2.75
Favites	960	980	20	1
Rubble	980	1140	160	8
Porites	1140	1430	290	14.5
Palythoa	1430	1475	45	2.25
Favites	1475	1500	25	1.25
Rock	1500	1510	10	0.5
Favites	1510	1530	20	1
Rock	1530	1550	20	1
Porites	1550	1715	165	8.25
Rock	1715	1730	15	0.75
Symphyllia	1730	1750	20	1
Rock	1750	1770	20	1
Symphyllia	1770	1790	20	1
Rock	1790	1850	60	3
Porites	1850	1875	25	1.25
Rock	1875	1905	30	1.5
Porites	1905	1925	20	1
Sand	1925	1950	25	1.25
Porites	1950	1990	40	2
Rock	1990	2000	10	0.5
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	80	80	4
Sand	80	260	180	9
Porites	260	470	210	10.5
Favites	470	500	30	1.5
Porites	500	800	300	15
Porites	800	860	60	3
Porites	860	890	30	1.5
Platygyra	890	910	20	1
Porites	910	940	30	1.5
Dead coral debris	940	980	40	2
Porites	980	1130	150	7.5
Rock	1130	1220	90	4.5
Porites	1220	1300	80	4
Rock	1300	1320	20	1
Porites	1320	1710	390	19.5
Sea anemone	1710	1760	50	2.5
Porites	1760	2000	240	12
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.00**
Porites component	**61.92**
Faviid coral component	**3.67**
Other living coral component	**2.50**
Other sessile organism compor	**2.42**
Dead coral component	**1.58**
Abiotic component	**27.92**
Total	**100.00**

Percent area coverage of major reef components on each 20 meter transect

	I	II	III
Acropora component	**0.00**	**0.00**	**0.00**
Porites component	**38.25**	**69.00**	**78.50**
Faviid coral component	**3.75**	**4.75**	**2.50**
Other living coral component	**5.50**	**2.00**	**0.00**
Other sessile organism component	**2.50**	**2.25**	**2.50**
Dead coral component	**0.75**	**2.00**	**2.00**
Abiotic component	**49.25**	**20.00**	**14.50**
Totals	**100.00**	**100.00**	**100.00**

1998 Sampling
Pattaya Station6
Nok Island

I	intervals		(cm)	%cover
Pontes	0	60	60	3
Gravel	60	190	130	6.5
Pontes	190	270	80	4
Rock	270	340	70	3.5
Pontes	340	385	45	2.25
Rock	385	420	35	1.75
Pontes	420	430	10	0.5
Dead coral	430	460	30	1.5
Pontes	460	510	50	2.5
Dead coral	510	530	20	1
Pontes	530	570	40	2
Gravel	570	600	30	1.5
Pontes	600	630	30	1.5
Dead coral	630	660	30	1.5
Gravel	660	680	20	1
Pontes	680	700	20	1
Gravel	700	930	230	11.5
Platygyra	930	945	15	0.75
Dead coral	945	1005	60	3
Gravel	1005	1040	35	1.75
Pontes	1040	1100	60	3
Rock	1100	1145	45	2.25
Pontes	1145	1230	85	4.25
Rock	1230	1265	35	1.75
Sand	1265	1300	35	1.75
Pontes	1300	1320	20	1
Gravel	1320	1430	110	5.5
Pocillopora	1430	1435	5	0.25
Rock	1435	1470	35	1.75
Pontes	1470	1490	20	1
Rock	1490	1560	70	3.5
Pontes	1560	1640	80	4
Palythoa	1640	1720	80	4
Pontes	1720	1770	50	2.5
Symphyllia	1770	1800	30	1.5
Gravel	1800	1850	50	2.5
Dead coral	1850	1885	35	1.75
Acropora (corymbose)	1885	1920	35	1.75
Rock	1920	1940	20	1
Favites	1940	1980	40	2
Palythoa	1980	2000	20	1
Totals			2000	100

II	intervals		(cm)	%cover
Acropora (corymbose)	0	40	40	2
Dead coral	40	55	15	0.75
Pontes	55	70	15	0.75
Rock	70	80	10	0.5
Pontes	80	150	70	3.5
Rock	150	180	30	1.5
Pontes	180	210	30	1.5
Rock	210	360	150	7.5
Pontes	360	410	50	2.5
Gravel	410	430	20	1
Pontes	430	620	190	9.5
Sand	620	640	20	1
Palythoa	640	680	40	2
Pontes	680	750	70	3.5
Gravel	750	865	115	5.75
Psamocora	865	890	25	1.25
Gravel	890	990	100	5
Pontes	990	1010	20	1
Palythoa	1010	1030	20	1
Rock	1030	1140	110	5.5
Pontes	1140	1200	60	3
Rock	1200	1380	180	9
Porites	1380	1390	10	0.5
Favites	1390	1405	15	0.75
Porites	1405	1420	15	0.75
Gravel	1420	1635	215	10.75
Pontes	1635	1645	10	0.5
Gravel	1645	1770	125	6.25
Pontes	1770	1780	10	0.5
Dead coral	1780	1795	15	0.75
Pontes	1795	1825	30	1.5
Gravel	1825	2000	175	8.75
Totals			2000	100

III	intervals		(cm)	%cover
Gravel	0	120	120	6
Symphyllia	120	140	20	1
Rock	140	260	120	6
Platygyra	260	275	15	0.75
Acropora (tabulate)	275	465	190	9.5
Rock	465	500	35	1.75
Pontes	500	585	85	4.25
Rock	585	600	15	0.75
Dead coral	600	670	70	3.5
Rock	670	740	70	3.5
Pocillopora	740	750	10	0.5
Symphyllia	750	775	25	1.25
Montipora	775	800	25	1.25
Pocillopora	800	820	20	1
Dead coral	820	865	45	2.25
Pontes	865	880	15	0.75
Acropora (corymbose)	880	900	20	1
Dead coral	900	915	15	0.75
Pontes	915	950	35	1.75
Palythoa	950	1020	70	3.5
Pocillopora	1020	1040	20	1
Palythoa	1040	1070	30	1.5
Rock	1070	1160	90	4.5
Acropora (corymbose)	1160	1180	20	1
Rock	1180	1210	30	1.5
Symphyllia	1210	1235	25	1.25
Rock	1235	1320	85	4.25
Montipora	1320	1330	10	0.5
Symphyllia	1330	1345	15	0.75
Montipora	1345	1365	20	1
Pontes	1365	1380	15	0.75
Palythoa	1380	1450	70	3.5
Pocillopora	1450	1480	30	1.5
Palythoa	1480	1580	100	5
Gravel	1580	1660	80	4
Palythoa	1660	1685	25	1.25
Montipora	1685	1710	25	1.25
Sand	1710	1765	55	2.75
Rock	1765	1820	55	2.75
Gravel	1820	2000	180	9
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**5.08**
Porites component	**23.00**
Faviid coral component	**1.42**
Other living coral component	**5.08**
Other sessile organism component	**7.58**
Dead coral component	**5.58**
Abiotic component	**52.25**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**1.75**	**2.00**	**11.50**
Porites component	**32.50**	**29.00**	**7.50**
Faviid coral component	**2.75**	**0.75**	**0.75**
Other living coral component	**1.75**	**1.25**	**12.25**
Other sessile organism component	**5.00**	**3.00**	**14.75**
Dead coral component	**8.75**	**1.50**	**6.50**
Abiotic component	**47.50**	**62.50**	**46.75**
Totals	**100.00**	**100.00**	**100.00**

1998 Sampling
Pattaya Station
Krok Island

I	intervals		(cm)	%cover
Acropora (corymbose)	2000	1980	20	1
Porites	1980	1880	100	5
Acropora (corymbose)	1880	1740	140	7
Montipora	1740	1720	20	1
Porites	1720	1640	80	4
Dead coral	1640	1570	70	3.5
Porites	1570	1420	150	7.5
Dead coral	1420	1385	35	1.75
Porites	1385	1340	45	2.25
Pavona	1340	1300	40	2
Dead coral	1300	1270	30	1.5
Sand	1270	1190	80	4
Dead coral	1190	1170	20	1
Favites	1170	1130	40	2
Porites	1130	840	290	14.5
Acropora (corymbose)	840	800	40	2
Dead coral	800	780	20	1
Porites	780	680	100	5
Sand	680	660	20	1
Porites	660	570	90	4.5
Pavona	570	530	40	2
Dead coral	530	515	15	0.75
Pavona	515	495	20	1
Porites	495	375	120	6
Dead coral	375	340	35	1.75
Porites	340	280	60	3
Acropora (corymbose)	280	240	40	2
Acropora (corymbose)	240	190	50	2.5
Dead coral	190	180	10	0.5
Acropora (corymbose)	180	140	40	2
Porites	140	70	70	3.5
Dead coral	70	0	70	3.5
Totals			2000	100

II	intervals		(cm)	%cover
Dead coral	2000	1900	100	5
Encrusting Tunicate	1900	1870	30	1.5
Dead coral	1870	1850	20	1
Encrusting Tunicate	1850	1790	60	3
Porites	1790	1730	60	3
Acropora (corymbose)	1730	1690	40	2
Porites	1690	1670	20	1
Dead coral	1670	1660	10	0.5
Porites	1660	1630	30	1.5
Dead coral	1630	1560	70	3.5
Platygyra	1560	1550	10	0.5
Dead coral	1550	1510	40	2
Porites	1510	1220	290	14.5
Dead coral	1220	1190	30	1.5
Acropora (corymbose)	1190	1180	10	0.5
Favites	1180	1135	45	2.25
Dead coral	1135	1035	100	5
Pavona	1035	990	45	2.25
Dead coral	990	885	105	5.25
Pavona	885	870	15	0.75
Dead coral	870	840	30	1.5
Pavona	840	790	50	2.5
Dead coral	790	750	40	2
Fungia	750	730	20	1
Dead coral	730	725	5	0.25
Pavona	725	690	35	1.75
Dead coral	690	470	220	11
Pavona	470	430	40	2
Symphyllia	430	420	10	0.5
Dead coral	420	390	30	1.5
Porites	390	370	20	1
Porites	370	360	10	0.5
Dead coral	360	325	35	1.75
Porites	325	290	35	1.75
Zooanthid	290	255	35	1.75
Goniopora	255	240	15	0.75
Dead coral	240	230	10	0.5
Porites	230	180	50	2.5
Pavona	180	100	80	4
Dead coral	100	60	40	2
Porites	60	0	60	3
Totals			2000	100

III	intervals		(cm)	%cover
Porites	0	120	120	6
Pavona	120	140	20	1
Porites	140	170	30	1.5
Dead coral	170	280	110	5.5
Porites	280	400	120	6
Dead coral	400	450	50	2.5
Porites	450	490	40	2
Pavona	490	510	20	1
Porites	510	550	40	2
Pavona	550	570	20	1
Dead coral	570	585	15	0.75
Pavona	585	620	35	1.75
Goniastrea	620	640	20	1
Porites	640	690	50	2.5
Dead coral	690	710	20	1
Porites	710	760	50	2.5
Dead coral	760	820	60	3
Pavona	820	840	20	1
Fungia	840	850	10	0.5
Dead coral	850	870	20	1
Pavona	870	880	10	0.5
Dead coral	880	925	45	2.25
Encrusting Tunicate	925	945	20	1
Lithophyllon edwardsi	945	960	15	0.75
Porites	960	990	30	1.5
Dead coral	990	1170	180	9
Porites	1170	1190	20	1
Dead coral	1190	1210	20	1
Symphyllia	1210	1250	40	2
Dead coral	1250	1270	20	1
Porites	1270	1290	20	1
Dead coral	1290	1410	120	6
Montipora	1410	1460	50	2.5
Pavona	1460	1480	20	1
Porites	1480	1510	30	1.5
Montipora	1510	1550	40	2
Pavona	1550	1585	35	1.75
Dead coral	1585	1620	35	1.75
Porites	1620	1760	140	7
Pocillopora	1760	1770	10	0.5
Porites	1770	1820	50	2.5
Dead coral	1820	1865	45	2.25
Porites	1865	1900	35	1.75
Platygyra	1900	1920	20	1
Porites	1920	1940	20	1
Montipora	1940	1950	10	0.5
Dead coral	1950	1990	40	2
Pocillopora	1990	2000	10	0.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	6.23
Porites component	39.65
Faviid coral component	2.72
Other living coral component	14.23
Other sessile organism component	2.41
Dead coral component	33.13
Abiotic component	1.63
Total	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	16.50	2.50	0.00
Porites component	50.25	28.75	38.75
Faviid coral component	2.00	2.75	2.00
Other living coral component	11.00	15.50	17.25
Other sessile organism component	0.00	6.25	1.00
Dead coral component	15.25	44.25	41.00
Abiotic component	5.00	0.00	0.00
Totals	100.00	100.00	100.00

1998 Sampling
Pattaya Station8
Lan Island

I	intervals		(cm)	%cover
Dead coral	0	20	20	1
Montipora	20	40	20	1
Dead coral	40	170	130	6.5
Sand	170	200	30	1.5
Zooanthid	200	210	10	0.5
Dead coral	210	350	140	7
Zooanthid	350	380	30	1.5
Sand	380	450	70	3.5
Zooanthid	450	580	130	6.5
Dead coral	580	615	35	1.75
Zooanthid	615	620	5	0.25
Dead coral	620	710	90	4.5
Zooanthid	710	750	40	2
Dead coral	750	1000	250	12.5
Zooanthid	1000	1030	30	1.5
Sand	1030	1160	130	6.5
Dead coral	1160	1200	40	2
Montipora	1200	1230	30	1.5
Dead coral	1230	1290	60	3
Montipora	1290	1375	85	4.25
Dead coral	1375	1400	25	1.25
Acropora (tabulate)	1400	1500	100	5
Dead coral	1500	1560	60	3
Dead coral	1560	1620	60	3
Sand	1620	1670	50	2.5
Dead coral	1670	1750	80	4
Sand	1750	1800	50	2.5
Dead coral	1800	1870	70	3.5
Favites	1870	1880	10	0.5
Dead coral	1880	2000	120	6
Totals			2000	100

II	intervals		(cm)	%cover
Dead coral	0	55	55	2.75
Zooanthid	55	85	30	1.5
Dead coral	85	110	25	1.25
Zooanthid	110	130	20	1
Dead coral	130	140	10	0.5
Acropora (branching)	140	160	20	1
Zooanthid	160	170	10	0.5
Sand	170	190	20	1
Dead coral	190	215	25	1.25
Zooanthid	215	230	15	0.75
Dead coral	230	710	480	24
Acropora (branching)	710	730	20	1
Dead coral	730	860	130	6.5
Fungia	860	870	10	0.5
Echinopora	870	900	30	1.5
Dead coral	900	1140	240	12
Porites lutea	1140	1150	10	0.5
Sand	1150	1160	10	0.5
Acropora (branching)	1160	1220	60	3
Montipora	1220	1250	30	1.5
Acropora (branching)	1250	1285	35	1.75
Montipora	1285	1290	5	0.25
Acropora (branching)	1290	1340	50	2.5
Montipora	1340	1400	60	3
Sand	1400	1540	140	7
Acropora (branching)	1540	1560	20	1
Symphyllia	1560	1580	20	1
Sand	1580	1590	10	0.5
Goniastrea	1590	1600	10	0.5
Sand	1600	1790	190	9.5
Acropora (branching)	1790	1880	90	4.5
Sand	1880	1950	70	3.5
Dead coral	1950	2000	50	2.5
Totals			2000	100

III	intervals		(cm)	%cover
Sand	0	200	200	10
Dead coral	200	300	100	5
Favia	300	320	20	1
Dead coral	320	335	15	0.75
Fungia (1)	335	350	15	0.75
Fungia (5)	350	390	40	2
Favia	390	415	25	1.25
Fungia (2)	415	445	30	1.5
Dead coral	445	460	15	0.75
Fungia (1)	460	465	5	0.25
Dead coral	465	480	15	0.75
Fungia (1)	480	490	10	0.5
Dead coral	490	510	20	1
Fungia (5)	510	545	35	1.75
Dead coral	545	575	30	1.5
Fungia (1)	575	590	15	0.75
Dead coral	590	645	55	2.75
Acropora (branching)	645	665	20	1
Dead coral	665	690	25	1.25
Fungia (1)	690	700	10	0.5
Dead coral	700	730	30	1.5
Fungia (1)	730	740	10	0.5
Sand	740	795	55	2.75
Fungia (1)	795	810	15	0.75
Fungia (3)	810	855	45	2.25
Sand	855	870	15	0.75
Fungia (4)	870	930	60	3
Acropora (branching)	930	980	50	2.5
Favia	980	1020	40	2
Acropora (branching)	1020	1060	40	2
Dead coral	1060	1190	130	6.5
Acropora (branching)	1190	1540	350	17.5
Dead coral	1540	1570	30	1.5
Acropora (branching)	1570	1780	210	10.5
Acropora grandis	1780	1800	20	1
Acropora (branching)	1800	1830	30	1.5
Dead coral	1830	1850	20	1
Platygyra	1850	1890	40	2
Dead coral	1890	1920	30	1.5
Platygyra	1920	1980	60	3
Acropora (branching)	1980	2000	20	1
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**18.92**
Porites component	**0.17**
Faviid coral component	**3.42**
Other living coral component	**9.67**
Other sessile organism component	**5.33**
Dead coral component	**45.17**
Abiotic component	**17.33**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	**II**	**III**
Acropora component	**5.00**	**14.75**	**37.00**
Porites component	**0.00**	**0.50**	**0.00**
Faviid coral component	**0.50**	**0.50**	**9.25**
Other living coral component	**6.75**	**7.75**	**14.50**
Other sessile organism component	**12.25**	**3.75**	**0.00**
Dead coral component	**59.00**	**50.75**	**25.75**
Abiotic component	**16.50**	**22.00**	**13.50**
Totals	**100.00**	**100.00**	**100.00**

1998 Sampling
Pattaya Station9
Jun Island

I	intervals		(cm)	%cover
Pontes	0	35	35	1.75
Poculopora	35	45	10	0.5
Dead coral	45	85	40	2
Pocilopora	85	100	15	0.75
Dead coral	100	120	20	1
Pontes	120	170	50	2.5
Dead coral	170	250	80	4
Montipora	250	270	20	1
Dead coral	270	290	20	1
Platygyra	290	310	20	1
Dead coral	310	340	30	1.5
Pontes	340	380	40	2
Montipora	380	510	130	6.5
Pontes	510	540	30	1.5
Pontes	540	600	60	3
Rock	600	680	80	4
Pontes	680	690	10	0.5
Rock	690	785	95	4.75
Encrusting sponge	785	790	5	0.25
Dead coral	790	800	10	0.5
Soft coral	800	810	10	0.5
Dead coral	810	820	10	0.5
Pontes	820	835	15	0.75
Soft coral	835	840	5	0.25
Pontes	840	870	30	1.5
Dead coral	870	950	80	4
Zooanthid	950	1000	50	2.5
Pontes	1000	1020	20	1
Platygyra	1020	1060	40	2
Pontes	1060	1080	20	1
Montipora	1080	1130	50	2.5
Zooanthid	1130	1170	40	2
Acropora (corymbose)	1170	1280	110	5.5
Pontes	1280	1340	60	3
Zooanthid	1340	1380	40	2
Encrusting sponge	1380	1400	20	1
Dead coral	1400	1460	60	3
Sand	1460	1560	100	5
Pontes	1560	1700	140	7
Acropora (branching)	1700	1720	20	1
Dead coral	1720	1800	80	4
Favites	1800	1820	20	1
Acropora (branching)	1820	2000	180	9
Totals			2000	100

II	intervals		(cm)	%cover
Montipora	0	170	170	8.5
Acropora (branching)	170	220	50	2.5
Pontes	220	315	95	4.75
Acropora (corymbose)	315	335	20	1
Dead coral	335	385	50	2.5
Acropora (tabulate)	385	405	20	1
Porites	405	425	20	1
Acropora (tabulate)	425	450	25	1.25
Dead coral	450	475	25	1.25
Acropora (tabulate)	475	680	205	10.25
Dead coral	680	700	20	1
Acropora (branching)	700	750	50	2.5
Dead coral	750	770	20	1
Symphyllia	770	800	30	1.5
Porites	800	910	110	5.5
Acropora (branching)	910	1010	100	5
Dead coral	1010	1050	40	2
Acropora (branching)	1050	1100	50	2.5
Porites	1100	1310	210	10.5
Dead coral	1310	1375	65	3.25
Pavona	1375	1430	55	2.75
Dead coral	1430	1485	55	2.75
Soft Coral	1485	1500	15	0.75
Dead coral	1500	1655	155	7.75
Acropora (branching)	1655	1670	15	0.75
Dead coral	1670	1685	15	0.75
Acropora (branching)	1685	1750	65	3.25
Dead coral	1750	1790	40	2
Porites	1790	1840	50	2.5
Dead coral	1840	1970	130	6.5
Porites	1970	2000	30	1.5
Totals			2000	100

III	intervals		(cm)	%cover
Pontes	0	130	130	6.5
Dead coral	130	220	90	4.5
Pontes	220	250	30	1.5
Sand	250	290	40	2
Pontes	290	470	180	9
Dead coral	470	500	30	1.5
Sand	500	550	50	2.5
Dead coral	550	600	50	2.5
Sand	600	660	60	3
Pontes	660	690	30	1.5
Sand	690	800	110	5.5
Montipora	800	900	100	5
Sand	900	940	40	2
Pontes	940	960	20	1
Zooanthid	960	1020	60	3
Pontes	1020	1080	60	3
Sand	1080	1160	80	4
Pontes	1160	1190	30	1.5
Montipora	1190	1300	110	5.5
Pontes	1300	1345	45	2.25
Sand	1345	1365	20	1
Pontes	1365	1450	85	4.25
Dead coral	1450	1510	60	3
Pontes	1510	1550	40	2
Platygyra	1550	1590	40	2
Sand	1590	1925	335	16.75
Platygyra	1925	1945	20	1
Dead coral	1945	1960	15	0.75
Pontes	1960	1985	25	1.25
Dead coral	1985	2000	15	0.75
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**14.77**
Porites component	**31.48**
Faviid coral component	**2.34**
Other living coral component	**10.28**
Other sessile organism component	**3.49**
Dead coral component	**21.50**
Abiotic component	**16.14**
Totals	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**20.32**	**24.00**	**0.00**
Porites component	**21.95**	**39.40**	**33.09**
Faviid coral component	**4.07**	**0.00**	**2.94**
Other living coral component	**10.36**	**10.20**	**10.29**
Other sessile organism component	**6.90**	**0.60**	**2.97**
Dead coral component	**25.20**	**24.60**	**14.71**
Abiotic component	**11.18**	**1.20**	**36.03**
Totals	**100.00**	**100.00**	**100.00**

1998 Sampling
Pattaya Station10
Sak Island

I	intervals		(cm)	%cover
Montipora	2170	2110	60	2.3
Dead coral	2110	1930	130	6.0
Montipora	1930	1920	60	2.3
Dead coral	1920	1860	60	2.3
Pontes	1860	1815	45	2.1
Montipora	1815	1790	25	1.2
Acropora (corymbose)	1790	1710	80	3.7
Dead coral	1710	1690	20	0.9
Pontes	1690	1560	130	6.0
Pontes	1560	1500	60	2.3
Pocillopora	1500	1470	30	1.4
Pontes	1470	1410	60	2.3
Dead coral	1410	1390	20	0.9
Pavona lata	1390	1370	20	0.9
Pontes	1370	1340	30	1.4
Pontes	1340	1300	40	1.8
Dead coral	1300	1260	40	1.8
Porites	1260	1180	80	3.7
Goniopora	1180	1120	60	2.8
Dead coral	1120	1065	55	2.5
Platygyra	1065	1045	20	0.9
Symphyllia	1045	970	75	3.5
Montipora	970	930	40	1.8
Dead coral	930	890	40	1.8
Montipora	890	860	30	1.4
Pontes	860	825	35	1.6
Montipora	825	770	55	2.5
Dead coral	770	730	40	1.8
Porites	730	680	50	2.3
Symphyllia	680	650	30	1.4
Dead coral	650	500	150	6.9
Pontes	500	440	60	2.8
Dead coral	440	430	10	0.5
Pocillopora	430	425	5	0.2
Dead coral	425	400	25	1.2
Porites	400	370	30	1.4
Favia	370	360	10	0.5
Softcoral	360	310	50	2.3
Softcoral	310	290	20	0.9
Dead coral	290	280	10	0.5
Pontes	280	240	40	1.8
Dead coral	240	230	10	0.5
Goniastrea	230	210	20	0.9
Dead coral	210	140	70	3.2
Porites	140	0	140	6.5
Totals			2000	100

II	intervals		(cm)	%cover
Pontes	0	25	25	1.25
Montipora	25	60	35	1.75
Pontes	60	120	60	3
Pontes	120	180	60	3
Montipora	180	220	40	2
Goniastrea	220	240	20	1
Sand	240	285	45	2.25
Montipora	285	350	65	3.25
Dead coral	350	390	40	2
Pontes	390	430	40	2
Montipora	430	520	90	4.5
Pontes	520	570	50	2.5
Montipora	570	610	40	2
Dead coral	610	660	50	2.5
Montipora	660	1170	510	25.5
Pontes	1170	1220	50	2.5
Dead coral	1220	1310	90	4.5
Pavona	1310	1320	10	0.5
Dead coral	1320	1365	45	2.25
Pontes	1365	1400	35	1.75
Pocillopora	1400	1420	20	1
Pontes	1420	1460	40	2
Dead coral	1460	1480	20	1
Montipora	1480	1540	60	3
Dead coral	1540	1555	15	0.75
Pontes	1555	1635	30	4
Dead coral	1635	1655	20	1
Montipora	1655	1730	75	3.75
Dead coral	1730	1755	25	1.25
Montipora	1755	1900	145	7.25
Dead coral	1900	1925	25	1.25
Montipora	1925	1950	25	1.25
Dead coral	1950	1980	30	1.5
Pontes	1980	2000	20	1
Totals			2000	100

III	intervals		(cm)	%cover
Montipora	0	50	50	2.5
Dead coral	50	70	20	1
Montipora	70	110	40	2
Dead coral	110	130	20	1
Montipora	130	170	40	2
Dead coral	170	280	110	5.5
Montipora	280	330	50	2.5
Dead coral	330	400	70	3.5
Montipora	400	450	50	2.5
Sand	450	570	120	6
Montipora	570	610	40	2
Sand	610	640	30	1.5
Montipora	640	680	40	2
Sand	680	710	30	1.5
Montipora	710	730	20	1
Dead coral	730	850	120	6
Montipora	850	890	40	2
Dead coral	890	920	30	1.5
Montipora	920	970	50	2.5
Dead coral	970	1070	100	5
Montipora	1070	1110	40	2
Dead coral	1110	1210	100	5
Montipora	1210	1375	165	8.25
Dead coral	1375	1400	25	1.25
Montipora	1400	1540	140	7
Pontes	1540	1580	40	2
Platygyra	1580	1650	70	3.5
Pontes	1650	1705	55	2.75
Montipora	1705	1730	25	1.25
Porites	1730	1790	60	3
Montipora	1790	1840	50	2.5
Pontes	1840	1880	40	2
Dead coral	1880	1900	20	1
Pontes	1900	1980	30	4
Galaxea	1980	2000	20	1
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**1.23**
Porites component	**24.54**
Faviid coral component	**2.27**
Other living coral component	**40.44**
Other sessile organism component	**1.08**
Dead coral component	**26.70**
Abiotic component	**3.75**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**3.69**	**0.00**	**0.00**
Porites component	**36.87**	**23.00**	**13.75**
Faviid coral component	**2.30**	**1.00**	**3.50**
Other living coral component	**22.57**	**55.75**	**43.00**
Other sessile organism component	**3.23**	**0.00**	**0.00**
Dead coral component	**31.34**	**18.00**	**30.75**
Abiotic component	**0.00**	**2.25**	**9.00**
Totals	**100.00**	**100.00**	**100.00**

1998 Sampling
Sattahip Station11
Kham Island

I	intervals		(cm)	%cover
Dead coral	2200	2110	90	4.1
Montipora	2110	2100	10	0.5
Dead coral	2100	2030	70	3.2
Fungia	2030	2020	10	0.5
Acropora (branching)	2020	1900	120	5.5
Montipora	1900	1890	10	0.5
Acropora (branching)	1890	1880	10	0.5
Dead coral	1880	1850	30	1.4
Acropora (branching)	1850	1840	10	0.5
Dead coral	1840	1830	10	0.5
Acropora (branching)	1830	1690	140	6.4
Dead coral	1690	1650	40	1.8
Acropora (branching)	1650	1630	20	0.9
Favites	1630	1620	10	0.5
Acropora (branching)	1620	1575	45	2.0
Dead coral	1575	1530	45	2.0
Favia	1530	1500	30	1.4
Sand	1500	1465	35	1.6
Dead coral	1465	1430	35	1.6
Acropora (corymbose)	1430	1405	25	1.1
Dead coral	1405	1280	125	5.7
Porites	1280	1230	50	2.3
Sand	1230	1210	20	0.9
Acropora (branching)	1210	1180	30	1.4
Dead coral	1180	1045	135	6.1
Fungia	1045	1020	25	1.1
Dead coral	1020	990	30	1.4
Fungia	990	970	20	0.9
Dead coral	970	830	140	6.4
Fungia	830	815	15	0.7
Dead coral	815	725	90	4.1
Montipora	725	695	30	1.4
Favites	695	675	20	0.9
Montipora	675	650	25	1.1
Pavona	650	630	20	0.9
Fungia	630	610	20	0.9
Dead coral	610	530	80	3.6
Fungia	530	520	10	0.5
Sand	520	510	10	0.5
Fungia	510	500	10	0.5
Sand	500	485	15	0.7
Fungia	485	470	15	0.7
Dead coral	470	460	10	0.5
Fungia	460	450	10	0.5
Fungia	450	435	15	0.7
Dead coral	435	425	10	0.5
Fungia	425	410	15	0.7
Dead coral	410	395	15	0.7
Fungia	395	390	5	0.2
Fungia	390	385	5	0.2
Fungia	385	383	2	0.1
Fungia	383	380	3	0.1
Fungia	380	375	5	0.2
Fungia	375	370	5	0.2
Dead coral	370	365	5	0.2
Fungia	365	360	5	0.2
Dead coral	360	330	30	1.4
Fungia	330	320	10	0.5
Fungia	320	300	20	0.9
Dead coral	300	250	50	2.3
Fungia	250	240	10	0.5
Dead coral	240	235	5	0.2
Fungia	235	220	15	0.7
Dead coral	220	205	15	0.7
Fungia	205	185	20	0.9
Fungia	185	175	10	0.5
Fungia	175	160	15	0.7
Dead coral	160	150	10	0.5
Fungia	150	140	10	0.5
Dead coral	140	0	140	6.4
Totals			2000	100

II	intervals		(cm)	%cover
Sea anemone	2200	2170	30	1.4
Dead coral	2170	2145	25	1.1
Sea anemone	2145	2120	25	1.1
Dead coral	2120	2010	110	5.0
Acropora (tabulate form)	2010	1950	60	2.7
Acropora (branching)	1950	1890	60	2.7
Porites	1890	1880	10	0.5
Dead coral	1880	1750	130	5.9
Montipora	1750	1730	20	0.9
Dead coral	1730	1715	15	0.7
Sea anemone	1715	1675	40	1.8
Fungia	1675	1470	205	9.3
Sea anemone	1470	1430	40	1.8
Sea anemone	1430	1400	30	1.4
Dead coral	1400	1320	80	3.6
Acropora (corymbose)	1320	1280	40	1.8
Galaxea	1280	1240	40	1.8
Acropora (branching)	1240	1210	30	1.4
Dead coral	1210	1130	80	3.6
Acropora (branching)	1130	920	210	9.5
Acropora (tabulate form)	920	860	60	2.7
Acropora (branching)	860	810	50	2.3
Dead coral	810	770	40	1.8
Acropora (tabulate form)	770	685	85	3.9
Dead coral	685	500	185	8.4
Dead coral	500	400	100	4.5
Zooanthid	400	30	370	16.8
Galaxea	30	0	30	1.4
Totals			2000	100

III	intervals		(cm)	%cover
Platygyra	0	20	20	1
Dead coral	20	50	30	1.5
Fungia	50	60	10	0.5
Acropora (branching)	60	80	20	1
Fungia	80	110	30	1.5
Dead coral	110	160	50	2.5
Fungia	160	170	10	0.5
Fungia	170	190	20	1
Fungia	190	210	20	1
Dead coral	210	280	70	3.5
Acropora (corymbose)	280	300	20	1
Fungia	300	310	10	0.5
Dead coral	310	350	40	2
Fungia	350	380	30	1.5
Fungia	380	385	5	0.25
Zooanthid	385	610	225	11.25
Fungia	610	620	10	0.5
Dead coral	620	700	80	4
Pocillopora	700	710	10	0.5
Fungia	710	860	150	7.5
Dead coral	860	940	80	4
Acropora (branching)	940	1010	70	3.5
Dead coral	1010	1030	20	1
Acropora (branching)	1030	1050	20	1
Dead coral	1050	1090	40	2
Acropora (branching)	1090	1100	10	0.5
Dead coral	1100	1110	10	0.5
Pocillopora	1110	1120	10	0.5
Acropora (branching)	1120	1140	20	1
Dead coral	1140	1210	70	3.5
Fungia	1210	1250	40	2
Dead coral	1250	1340	90	4.5
Fungia	1340	1390	50	2.5
Fungia	1390	1475	85	4.25
Acropora (branching)	1475	1490	15	0.75
Dead coral	1490	1530	40	2
Fungia	1530	1580	50	2.5
Acropora (branching)	1580	1700	120	6
Acropora (branching)	1700	1910	210	10.5
Goniastrea	1910	1950	40	2
Fungia	1950	1960	10	0.5
Acropora (branching)	1960	2000	40	2
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	25.58
Porites component	0.91
Faviid coral component	1.78
Other living coral component	20.69
Other sessile organism component	11.37
Dead coral component	38.46
Abiotic component	1.21
Total	100.00

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	18.18	27.05	31.52
Porites component	2.27	0.45	0.00
Faviid coral component	2.73	0.00	2.61
Other living coral component	18.18	14.77	29.13
Other sessile organism component	0.00	24.32	9.78
Dead coral component	55.00	33.41	26.96
Abiotic component	3.64	0.00	0.00
Totals	100.00	100.00	100.00

1998 Sampling
Sattahip Sattahip12
Yoh Island

I	intervals		(cm)	%cover
Platygyra	0	20	20	1
Dead coral	20	40	20	1
Acropora (tabulate)	40	225	185	9.25
Acropora (branching)	225	240	15	0.75
Dead coral	240	260	20	1
Acropora (branching)	260	280	20	1
Acropora (tabulate)	280	455	175	8.75
Platygyra	455	530	75	3.75
Acropora (tabulate)	530	840	310	15.5
Acropora (branching)	840	860	20	1
Dead coral	860	890	30	1.5
Acropora (branching)	890	940	50	2.5
Dead coral	940	980	40	2
Acropora (branching)	980	1000	20	1
Dead coral	1000	1030	30	1.5
Acropora (branching)	1030	1100	70	3.5
Dead coral	1100	1130	30	1.5
Acropora (branching)	1130	1180	50	2.5
Acropora (tabulate)	1180	1200	20	1
Porites	1200	1220	20	1
Platygyra	1220	1260	40	2
Acropora (tabulate)	1260	1400	140	7
Goniastrea	1400	1420	20	1
Acropora (branching)	1420	1460	40	2
Acropora (tabulate)	1460	1610	150	7.5
Dead coral	1610	1640	30	1.5
Acropora (branching)	1640	1670	30	1.5
Dead coral	1670	1760	90	4.5
Acropora (tabulate)	1760	1920	160	8
Dead coral	1920	1940	20	1
Acropora (branching)	1940	1970	30	1.5
Dead coral	1970	2000	30	1.5
Totals			2000	100

I	intervals		(cm)	%cover
Acropora (branching)	2000	2120	120	6.7
Acropora (tabulate)	2120	2160	40	2.2
Acropora (branching)	2160	2400	240	13.3
Acropora (branching)	2400	2500	100	5.6
Acropora (tabulate)	2500	2660	160	8.9
Acropora (branching)	2660	2680	20	1.1
Acropora (branching)	2680	2720	40	2.2
Acropora (branching)	2720	2770	50	2.8
Acropora (tabulate)	2770	2800	30	1.7
Platygyra	0	30	30	1.7
Acropora (tabulate)	30	220	190	10.6
Porites	220	230	10	0.6
Montipora	230	240	10	0.6
Acropora (tabulate)	240	370	130	7.2
Platygyra	370	410	40	2.2
Acropora (tabulate)	410	420	10	0.6
Acropora (corymbose)	420	540	120	6.7
Acropora (tabulate)	540	590	50	2.8
Acropora (tabulate)	590	800	210	11.7
Dead coral	800	870	70	3.9
Acropora (branching)	870	900	30	1.7
Platygyra	900	910	10	0.6
Acropora (tabulate)	910	1000	90	5.0
Totals			2000	100

I	intervals		(cm)	%cover
Acropora (branching)	1000	1200	200	10
Acropora (tabulate)	1200	1250	50	2.5
Dead coral	1250	1370	120	6
Porites	1370	1390	20	1
Acropora (branching)	1390	1430	40	2
Porites	1430	1450	20	1
Dead coral	1450	1500	50	2.5
Acropora (branching)	1500	1860	360	18
Acropora (tabulate)	1860	1960	100	5
Acropora (tabulate)	1960	2000	40	2
Acropora (branching)	2000	2250	250	12.5
Acropora (tabulate)	2250	2280	30	1.5
Pavona	2280	2350	70	3.5
Echinopora	2350	2380	30	1.5
Acropora (tabulate)	2380	2420	40	2
Dead coral	2420	2450	30	1.5
Acropora (branching)	2450	2500	50	2.5
Pocillopora	2500	2510	10	0.5
Acropora (tabulate)	2510	2850	340	17
Acropora (branching)	2850	3000	150	7.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**80.75**
Porites component	**1.50**
Faviid coral component	**4.42**
Other living coral component	**2.00**
Other sessile organism component	**0.33**
Dead coral component	**10.17**
Abiotic component	**0.83**
Totals	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**74.25**	**91.50**	**76.50**
Porites component	**1.00**	**0.50**	**3.00**
Faviid coral component	**7.75**	**4.00**	**1.50**
Other living coral component	**0.00**	**0.50**	**5.50**
Other sessile organism component	**0.00**	**0.00**	**1.00**
Dead coral component	**17.00**	**3.50**	**10.00**
Abiotic component	**0.00**	**0.00**	**2.50**
Totals	**100.00**	**100.00**	**100.00**

1998 Sampling
Sattahip Station 13
Samaesan Island

I	intervals		(cm)	%cover
Zooanthid	0	45	45	2.25
Dead coral	45	60	15	0.75
Zooanthid	60	110	50	2.5
Sand	110	140	30	1.5
Porites	140	195	55	2.75
Dead coral	195	255	60	3
Porites	255	295	40	2
Platygyra	295	315	20	1
Coeloseris	315	335	20	1
Dead coral	335	355	20	1
Zooanthid	355	380	25	1.25
Sand	380	400	20	1
Zooanthid	400	450	50	2.5
Dead coral	450	520	70	3.5
Dead coral	520	570	50	2.5
Coeloseris	570	585	15	0.75
Dead coral	585	865	280	14
Porites	865	885	20	1
Dead coral	885	975	90	4.5
Zooanthid	975	1000	25	1.25
Dead coral	1000	1200	200	10
Favites	1200	1240	40	2
Zooanthid	1240	1305	65	3.25
Porites	1305	1340	35	1.75
Sand	1340	1360	20	1
Platygyra	1360	1370	10	0.5
Zooanthid	1370	1400	30	1.5
Sand	1400	1445	45	2.25
Coeloseris	1445	1460	15	0.75
Sand	1460	1485	25	1.25
Platygyra	1485	1510	25	1.25
Zooanthid	1510	1540	30	1.5
Sand	1540	1570	30	1.5
Porites	1570	1600	30	1.5
Sand	1600	1680	80	4
Platygyra	1680	1720	40	2
Favites	1720	1770	50	2.5
Dead coral	1770	1800	30	1.5
Porites	1800	1820	20	1
Dead coral	1820	1930	110	5.5
Porites	1930	1945	15	0.75
Favites	1945	1980	35	1.75
Dead coral	1980	2000	20	1
Totals			2000	100

II	intervals		(cm)	%cover
Favites	2000	2030	30	1.5
Dead coral	2030	2050	20	1
Platygyra	2050	2075	25	1.25
Dead coral	2075	2115	40	2
Coeloseris	2115	2145	30	1.5
Sand	2145	2175	30	1.5
Platygyra	2175	2135	10	0.5
Favites	2185	2200	15	0.75
Dead coral	2200	2235	35	1.75
Favites	2235	2270	35	1.75
Dead coral	2270	2315	45	2.25
Porites	2315	2390	75	3.75
Porites	2390	2480	90	4.5
Dead coral	2480	2495	15	0.75
Favia	2495	2515	20	1
Sand	2515	2710	195	9.75
Dead coral	2710	2810	100	5
Sand	2810	2870	60	3
Porites	2870	2900	30	1.5
Dead coral	2900	2930	30	1.5
Sand	2930	2955	25	1.25
Coeloseris	2955	2965	10	0.5
Dead coral	2965	3000	35	1.75
Coeloseris	3000	3020	20	1
Sand	3020	3025	5	0.25
Porites	3025	3035	10	0.5
Dead coral	3035	3090	55	2.75
Porites	3090	3130	40	2
Sand	3130	3330	200	10
Coeloseris	3330	3375	45	2.25
Favia	3375	3390	15	0.75
Sand	3390	3470	80	4
Favia	3470	3475	5	0.25
Pocillopora	3475	3485	10	0.5
Platygyra	3485	3530	45	2.25
Sand	3530	3625	95	4.75
Platygyra	3625	3645	20	1
Platygyra	3645	3685	40	2
Sand	3685	3740	55	2.75
Porites	3740	3780	40	2
Sand	3780	4000	220	11
Totals			2000	100

III	intervals		(cm)	%cover
Sand	4000	4060	60	3
Porites	4060	4110	50	2.5
Acropora (corymbose)	4110	4150	40	2
Sand	4150	4260	110	5.5
Dead coral	4260	4290	30	1.5
Porites	4290	4300	10	0.5
Dead coral	4300	4330	30	1.5
Dead coral	4330	4355	25	1.25
Porites	4355	4360	5	0.25
Dead coral	4360	4365	5	0.25
Pavona lata	4365	4380	15	0.75
Sand	4380	4455	75	3.75
Coeloseris	4455	4480	25	1.25
Sand	4480	4505	25	1.25
Coeloseris	4505	4520	15	0.75
Dead coral	4520	4560	40	2
Platygyra	4560	4570	10	0.5
Dead coral	4570	4650	80	4
Porites	4650	4675	25	1.25
Porites lichen	4675	4700	25	1.25
Dead coral	4700	4760	60	3
Porites	4760	4790	30	1.5
Sand	4790	4845	55	2.75
Porites	4845	4910	65	3.25
Sand	4910	4945	35	1.75
Porites lichen	4945	5000	55	2.75
Dead coral	0	90	90	4.5
Platygyra	90	120	30	1.5
Dead coral	120	130	10	0.5
Porites	130	155	25	1.25
Pocillopora	155	160	5	0.25
Porites	160	175	15	0.75
Platygyra	175	180	5	0.25
Dead coral	180	220	40	2
Coeloseris	220	230	10	0.5
Dead coral	230	320	90	4.5
Sand	320	460	140	7
Coeloseris	460	500	40	2
Sand	500	520	20	1
Alveopora	520	560	40	2
Dead coral	560	830	270	13.5
Echinopora	830	1000	170	8.5
Totals			2000	100

Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**0.67**
Porites component	**13.42**
Faviid coral component	**8.75**
Other living coral component	**8.08**
Other sessile organism compone	**5.33**
Dead coral component	**34.83**
Abiotic component	**28.92**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

	I	II	III
Acropora component	**0.00**	**0.00**	**2.00**
Porites component	**10.75**	**14.25**	**15.25**
Faviid coral component	**11.00**	**13.00**	**2.25**
Other living coral component	**2.50**	**5.75**	**16.00**
Other sessile organism component	**16.00**	**0.00**	**0.00**
Dead coral component	**47.25**	**18.75**	**38.50**
Abiotic component	**12.50**	**48.25**	**26.00**
Totals	**100.00**	**100.00**	**100.00**

1998 Sampling
Sattahip Sattahip 14
Reat Island

I	intervals		(cm)	%cover
Porites	0	50	50	2.5
Dead coral	50	90	40	2
Porites	90	110	20	1
Dead coral	110	125	15	0.75
Porites	125	130	5	0.25
Pocillopora	130	140	10	0.5
Porites	140	270	130	6.5
Platygyra	270	300	30	1.5
Dead coral	300	370	70	3.5
Porites	370	390	20	1
Platygyra	390	420	30	1.5
Dead coral	420	440	20	1
Porites	440	480	40	2
Sand	480	500	20	1
Porites	500	575	75	3.75
Sand	575	600	25	1.25
Porites	600	630	30	1.5
Dead coral	630	670	40	2
Porites	670	715	45	2.25
Acropora (corymbose)	715	745	30	1.5
Sand	745	800	55	2.75
Goniopora	800	825	25	1.25
Pavona	825	845	20	1
Porites	845	915	70	3.5
Goniopora	915	935	20	1
Porites	935	960	25	1.25
Acropora (corymbose)	960	1000	40	2
Sand	1000	1030	30	1.5
Porites	1030	1080	50	2.5
Dead coral	1080	1090	10	0.5
Porites	1090	1100	10	0.5
Dead coral	1100	1120	20	1
Porites	1120	1135	15	0.75
Dead coral	1135	1200	65	3.25
Porites	1200	1235	35	1.75
Sand	1235	1290	55	2.75
Porites	1290	1300	10	0.5
Dead coral	1300	1460	160	8
Porites	1460	1500	40	2
Dead coral	1500	1540	40	2
Porites	1540	1550	10	0.5
Dead coral	1550	1580	30	1.5
Porites	1580	1600	20	1
Dead coral	1600	1680	80	4
Porites	1680	1700	20	1
Dead coral	1700	1800	100	5
Porites	1800	1860	60	3
Sand	1860	1880	20	1
Porites	1880	1900	20	1
Sand	1900	1940	40	2
Porites	1940	2000	60	3
Totals			2000	100

II	intervals		(cm)	%cover
Dead coral	2000	2235	235	11.75
Porites	2235	2265	30	1.5
Sand	2265	2315	50	2.5
Porites	2315	2340	25	1.25
Sand	2340	2490	150	7.5
Porites	2490	2600	110	5.5
Dead coral	2600	2630	30	1.5
Porites	2630	2650	20	1
Sand	2650	2670	20	1
Porites	2670	2735	65	3.25
Sand	2735	2770	35	1.75
Porites	2770	2825	55	2.75
Dead coral	2825	2845	20	1
Porites	2845	2930	85	4.25
Porites	2930	3000	70	3.5
Sand	0	120	120	6
Acropora (corymbose)	120	180	60	3
Sand	180	225	45	2.25
Porites	225	250	25	1.25
Dead coral	250	275	25	1.25
Porites	275	300	25	1.25
Sand	300	345	45	2.25
Porites	345	440	95	4.75
Dead coral	440	480	40	2
Porites	480	500	20	1
Sand	500	520	20	1
Porites	520	540	20	1
Dead coral	540	570	30	1.5
Sand	570	660	90	4.5
Porites	660	705	45	2.25
Sand	705	815	110	5.5
Porites	815	835	20	1
Dead coral	835	920	85	4.25
Sand	920	1000	80	4
Totals			2000	100

III	intervals		(cm)	%cover
Sand	1000	1590	590	29.5
Porites	1590	1610	20	1
Dead coral	1610	1630	20	1
Porites	1630	1670	40	2
Dead coral	1670	1700	30	1.5
Porites	1700	1715	15	0.75
Sand	1715	1750	35	1.75
Porites	1750	1765	15	0.75
Sand	1765	1800	35	1.75
Porites	1800	1810	10	0.5
Pocillopora	1810	1820	10	0.5
Porites	1820	1830	10	0.5
Dead coral	1830	2015	185	9.25
Porites	2015	2110	95	4.75
Sand	2110	2150	40	2
Porites	2150	2160	10	0.5
Dead coral	2160	2180	20	1
Porites	2180	2230	50	2.5
Sand	2230	2260	30	1.5
Dead coral	2260	2310	50	2.5
Porites	2310	2325	15	0.75
Sand	2325	2420	95	4.75
Porites	2420	2520	100	5
Dead coral	2520	2560	40	2
Porites	2560	2580	20	1
Dead coral	2580	2610	30	1.5
Porites	2610	2625	15	0.75
Dead coral	2625	2670	45	2.25
Porites	2670	2720	50	2.5
Dead coral	2720	2740	20	1
Porites	2740	2760	20	1
Dead coral	2760	2810	50	2.5
Favites	2810	2830	20	1
Dead coral	2830	2850	20	1
Pocillopora	2850	2870	20	1
Dead coral	2870	2890	20	1
Porites	2890	2910	20	1
Sand	2910	2940	30	1.5
Porites	2940	2970	30	1.5
Sand	2970	2980	10	0.5
Porites	2980	3000	20	1
Totals			2000	100

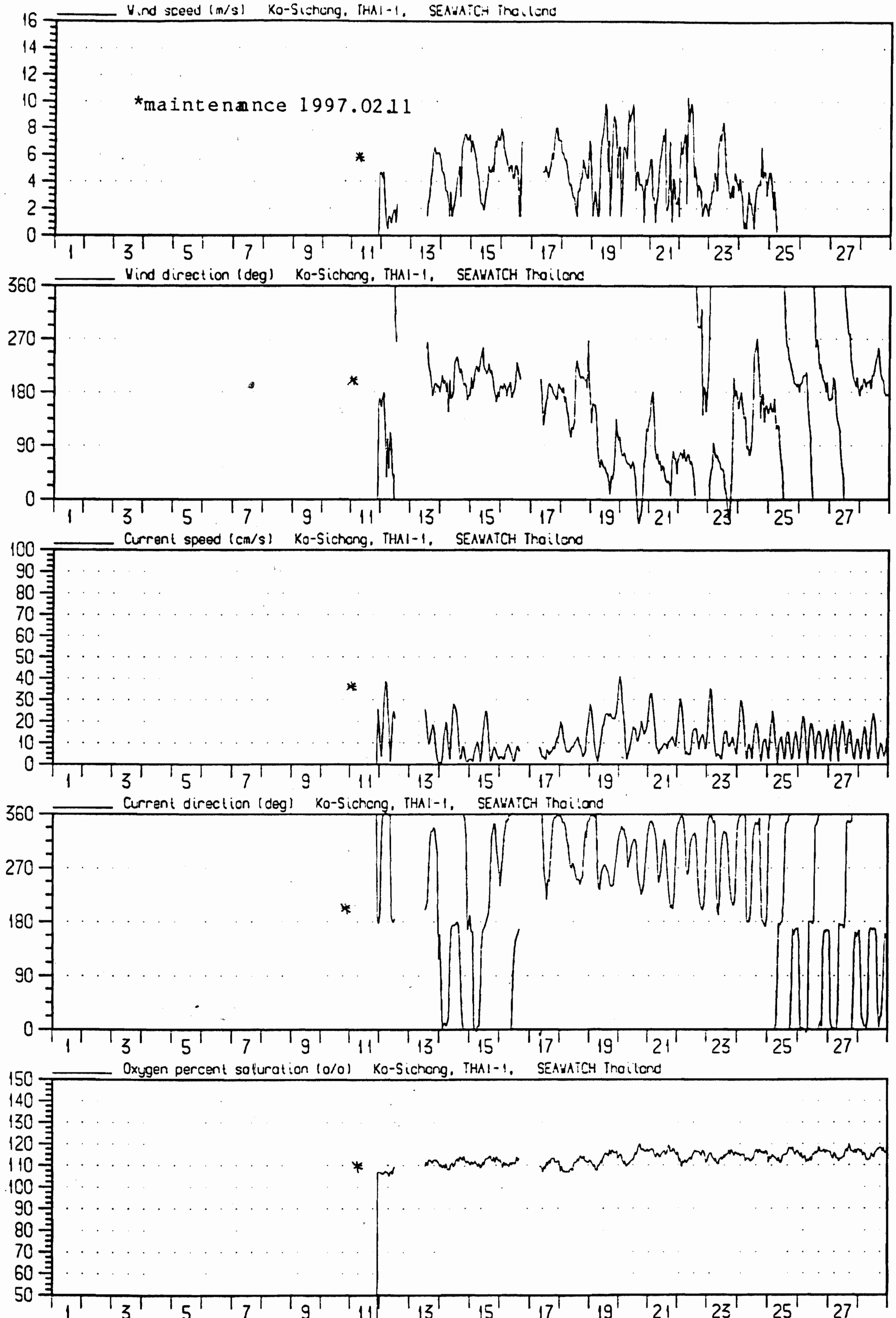
Percent area coverage of major reef components relative to 60 meter long transect

	(%)
Acropora component	**2.17**
Porites component	**35.42**
Faviid coral component	**1.33**
Other living coral component	**1.75**
Other sessile organism component	**0.00**
Dead coral component	**28.08**
Abiotic component	**31.25**
Total	**100.00**

Percent area coverage of major reef components on each 20-meter transect

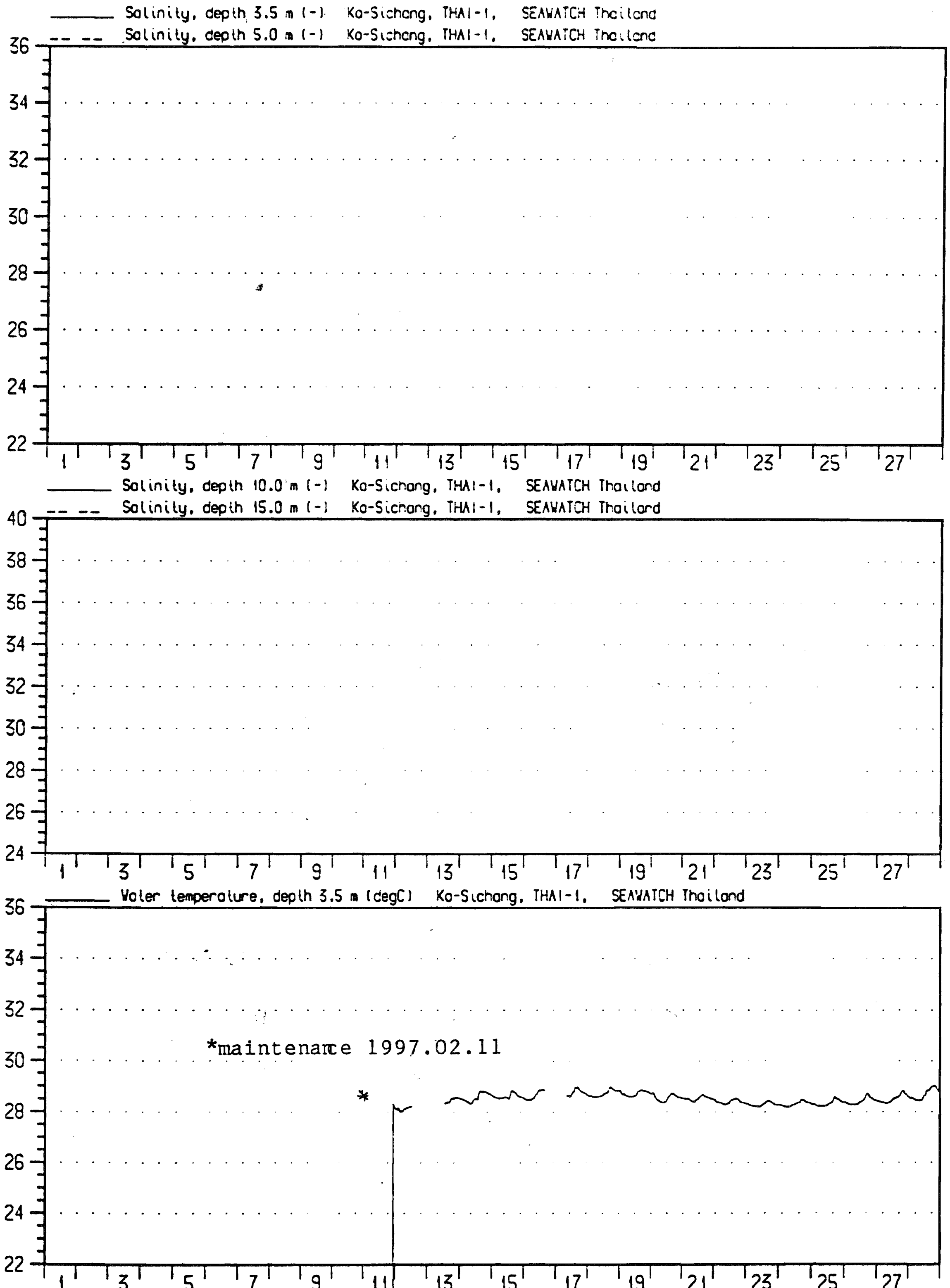
	I	II	III
Acropora component	**3.50**	**3.00**	**0.00**
Porites component	**43.00**	**35.50**	**27.75**
Faviid coral component	**3.00**	**0.00**	**1.00**
Other living coral component	**3.75**	**0.00**	**1.50**
Other sessile organism component	**0.00**	**0.00**	**0.00**
Dead coral component	**34.50**	**23.25**	**26.50**
Abiotic component	**12.25**	**38.25**	**43.25**
Totals	**100.00**	**100.00**	**100.00**

APPENDIX 2. Samples of Satellite buoy data sets from the National Research Council of Thailand

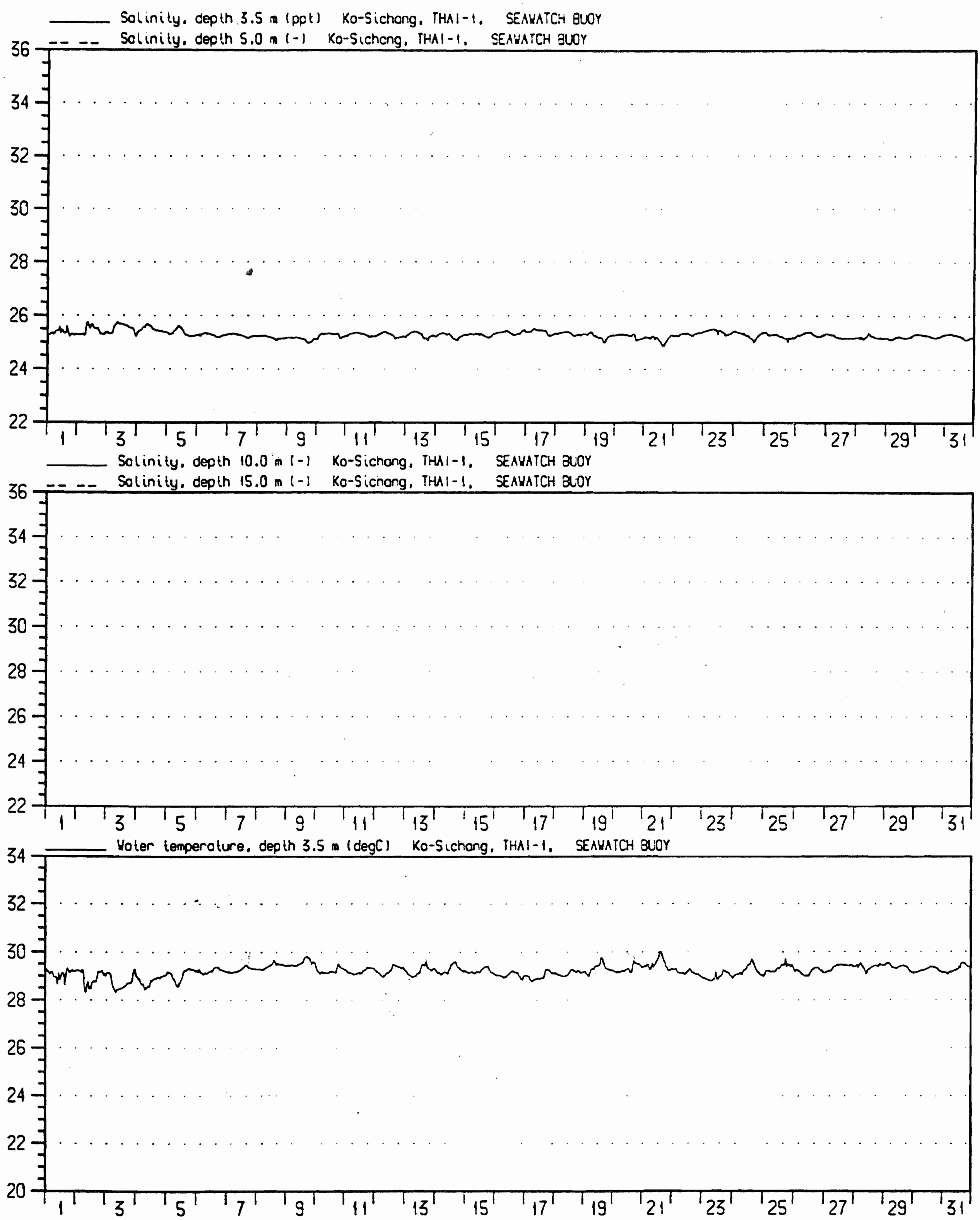


Time series from Ko Sichang				INSTRUMENT Seawatch Buoy
LOCATION Ko-Sichang, THAI-1	STATION 01	HAMSL 0 m	INSTRUMENT HEIGHT 0 m	OBSERVATION PERIOD 1997.02.01-1997.02.28 LT
NRCT National Research Council of Thailand			PROJECT 02	FIGURE 1

crkon41/cpp

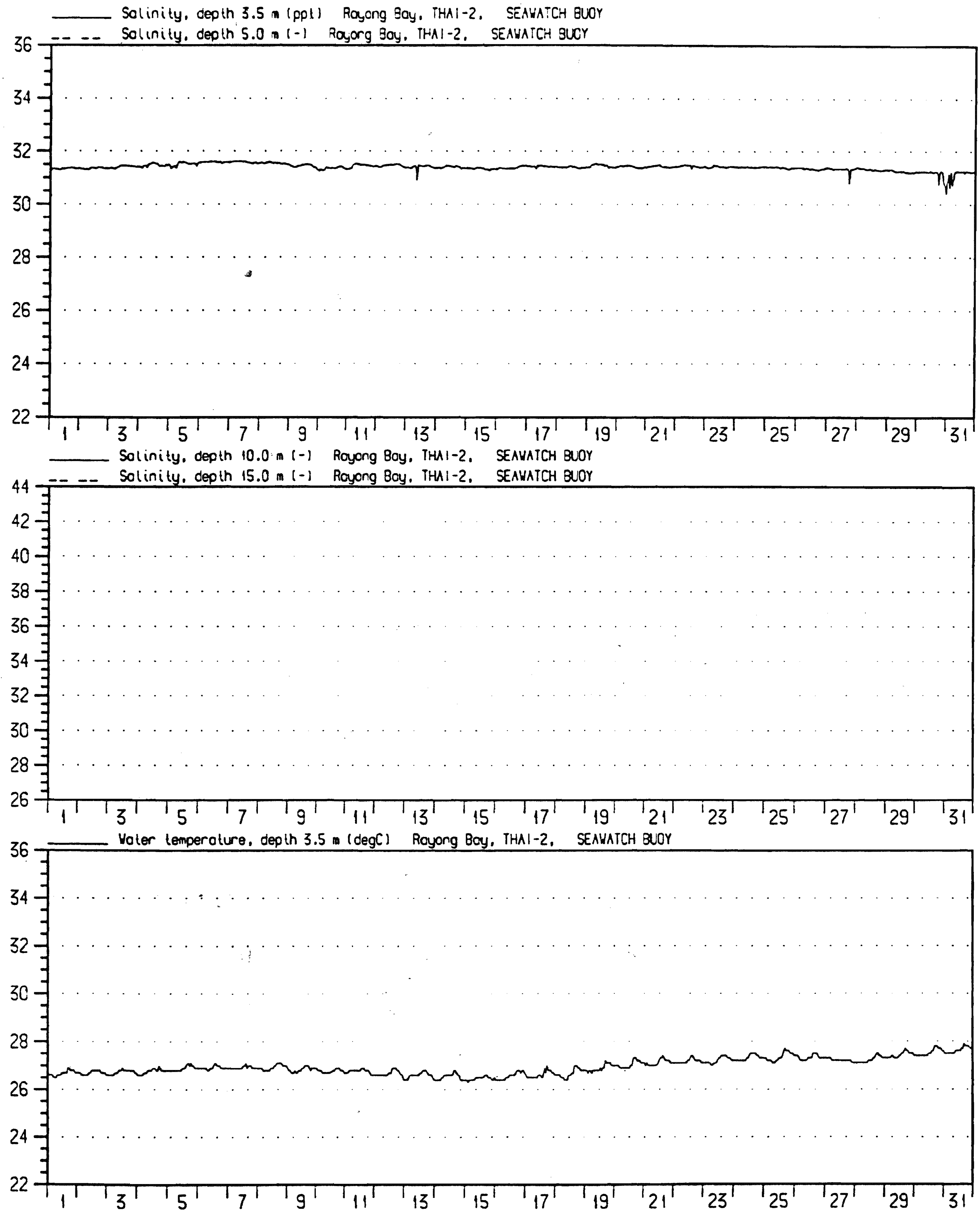


Time series from Ko Sichang				INSTRUMENT Seawatch Buoy
LOCATION Ko-Sichang, THAI-1	STATION 01	HAMSL 0 m	INSTRUMENT HEIGHT 0 m	OBSERVATION PERIOD 1997.02.01-1997.02.28 LT
NRCT National Research Council of Thailand			PROJECT 02	FIGURE 2



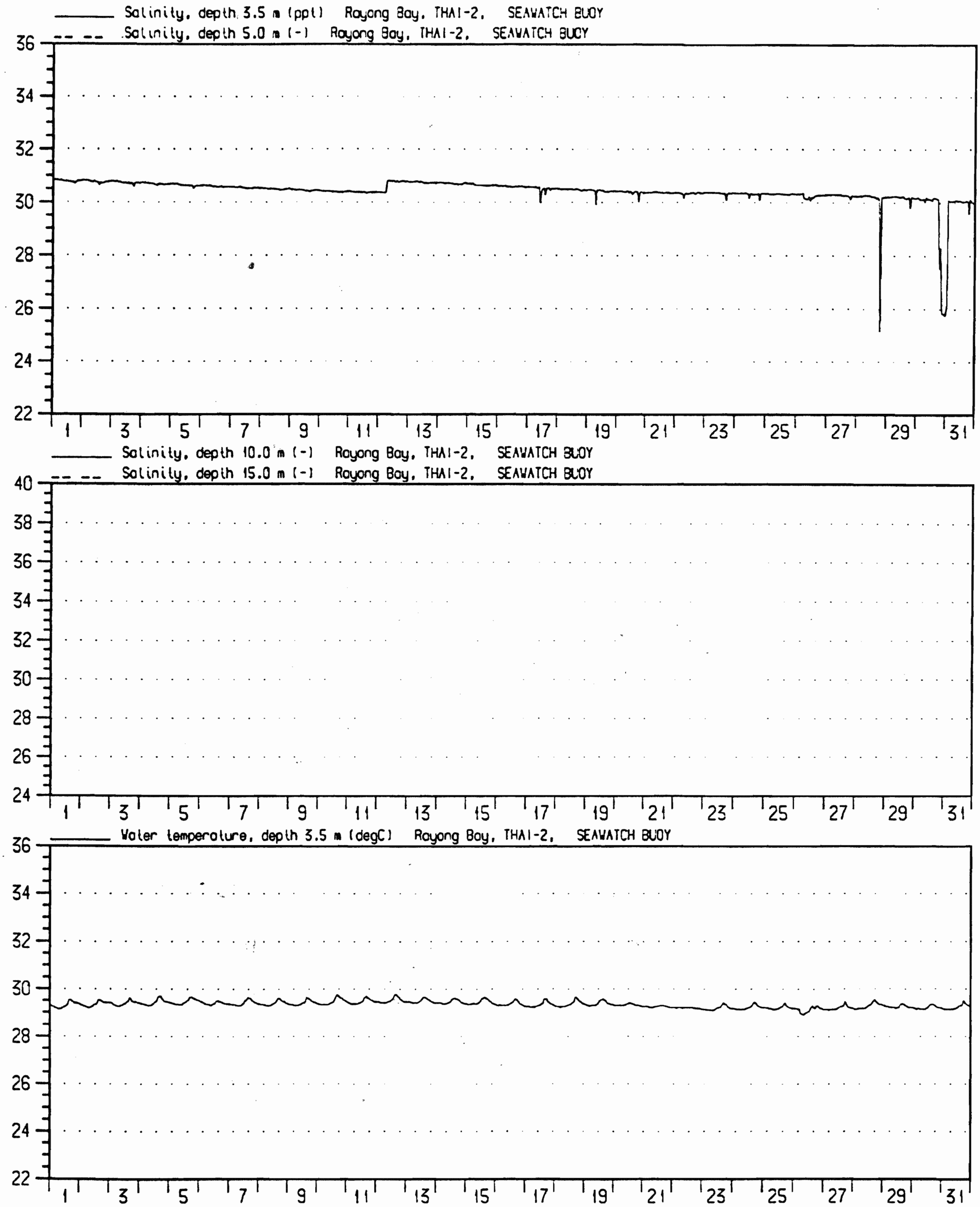
Time series from Ko Sichang				INSTRUMENT Seawatch Buoy
LOCATION Ko-Sichang, THAI-1	STATION 01	HAMSL 0 m	INSTRUMENT HEIGHT 0 m	OBSERVATION PERIOD 1998.01.01-1998.01.31 LT
NRCT National Research Council of Thailand			PROJECT 02	FIGURE 2

orkan41/cpp



Time series from Rayong				INSTRUMENT Seawatch Buoy
LOCATION Rayong Bay, THAI-2	STATION 02	WATER DEPTH 20 m	INSTRUMENT HEIGHT 0 m	OBSERVATION PERIOD 1997.01.01-1997.01.31 LT
NRCT National Research Council of Thailand			PROJECT 02	FIGURE 2

orkan41/app



Time series from Rayong				INSTRUMENT Seawatch Buoy
LOCATION Rayong Bay, THAI-2	STATION 02	HAMSL 0 m	INSTRUMENT HEIGHT 0 m	OBSERVATION PERIOD 1998.01.01-1998.01.31 LT
NRCT National Research Council of Thailand			PROJECT 02	FIGURE 2